

Mr. John Grantham
State of Washington
Department of Ecology
Nuclear & Mixed Waste Program
P. O. Box 47600
Olympia, WA 98504-7600

FLUOR DANIEL, INC.

Date: April 2, 1993

Reference: Hanford Waste Vitrification Plant
DOE Contract DE-AC06-86RL10838
Fluor Contract 8457

Transmittal No.: WDOE-385

Dear Mr. Grantham:

TRANSMITTAL

We enclose * copy of the items listed below. These are issued per US-DOE request.
*2 FULLSIZE (ROLLED) 1 REDUCED, 2 SPECIFICATION

Response due to Fluor: N/A

Responds to: A160 PACKAGE

NUMBER	REV	DATE	TITLE
SEE TRANSMITTAL ATTACHMENT	----	-----	A160 PACKAGE MECHANICAL SITE UTILITIES
			NOTE: THESE DOCUMENTS ARE ISSUED IN RESPONSE TO UCAT'S REQUEST TO EXPEDITE FIRE AND SANITARY WATER PORTIONS OF A160 FOR CR'S 690, 760, 917 AND 960. THIS PACKAGE IS BEING SENT IN 2 PARTS:
			(1) TRANSMITTAL WDOE-385 FOR REVISED DWGS AND SPECS.
			(2) TRANSMITTAL WDOE-386 FOR DCN'S.

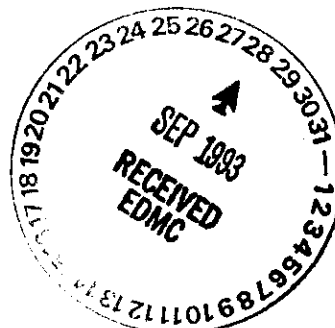
Distribution:

Reference: FRP-868, FUP-419
R. L. Long: DOE-RL w/0
TWP/AME Corresp Cntrl Cntr, MSIN A5-10
(A160 PACKAGE), w/0
P. Felise, WHC-RL (MSIN G6-16), w/1F, SPEC
Environmental Data Management Center
(MSIN H6-08), w/1F, 1 SPEC
D. Duncan, US EPA, Region X, w/0

Very truly yours,

R. S. Poulter
R. S. Poulter
Project Director

MHF
RSP:MHF:lt



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DATE 04/02/93
CONTRACT 80845734

Time: 09:09 AM

HANFORD WASTE VITRIFICATION PLANT
COORDS LISTING OF DRAWINGS FOR PKG A160

DISC	PACKAGE	DRAWING NUMBER	SHT NO.	REV	SIGNATURE DATE	DRAWING TITLE	REMARKS
05	A160	H-2-117151	1	3	04/01/93	CIVIL UNDERGROUND UTILITY INFORMATION SHEET	
05	A160	H-2-117152	1	3	04/01/93	CIVIL UNDERGROUND UTILITY PLAN	
05	A160	H-2-117153	1	3	04/01/93	CIVIL UNDERGROUND UTILITY PLAN	
05	A160	H-2-117154	1	3	04/01/93	CIVIL UNDERGROUND UTILITY PLAN	
05	A160	H-2-117155	1	3	04/01/93	CIVIL UNDERGROUND UTILITY PLAN	
05	A160	H-2-117156	1	3	04/01/93	CIVIL UNDERGROUND UTILITY PLAN	
05	A160	H-2-117158	1	3	04/01/93	CIVIL UNDERGROUND UTILITY PLAN	
05	A160	H-2-117159	1	3	04/01/93	CIVIL UNDERGROUND UTILITY PLAN	
05	A160	H-2-117160	1	3	04/01/93	CIVIL UNDERGROUND UTILITY PLAN	
05	A160	H-2-117161	1	1	04/01/93	CIVIL UNDERGROUND UTILITIES SECTIONS & DETAILS	
05	A160	H-2-117162	1	1	04/01/93	CIVIL UNDERGROUND UTILITIES SECTIONS & DETAILS	
05	A160	H-2-117164	1	2	04/01/93	CIVIL UNDERGROUND UTILITIES SECTIONS & DETAILS	
05	A160	H-2-117165	1	3	04/01/93	CIVIL DRX LINES PROFILES	
05	A160	H-2-117166	1	2	04/01/93	CIVIL SANITARY SEWER PROFILES	
05	A160	H-2-117167	1	2	04/01/93	CIVIL SANITARY SEWER PROFILES	
05	A160	H-2-117168	1	2	04/01/93	CIVIL SANITARY SEWER PLAN & PROFILES	
05	A160	H-2-117172	1	2	04/01/93	CIVIL SANITARY SEWER SECTIONS & DETAILS	
05	A160	H-2-117174	1	1	04/01/93	CIVIL SWX AND RWX PIPE PROFILES	
05	A160	H-2-117175	1	1	04/01/93	CIVIL SWX AND RWX PIPE PROFILES	
05	A160	H-2-117176	1	1	04/01/93	CIVIL SWX AND RWX PIPE PROFILES	
05	A160	H-2-117177	1	2	04/01/93	CIVIL SWX, FWX, AND DRX PIPE PROFILES	
05	A160	H-2-117178	1	1	04/01/93	CIVIL SWX AND FWX PIPE PROFILES	
05	A160	H-2-117179	1	1	04/01/93	CIVIL SWX AND FWX PIPE PROFILES	
30	A160	H-2-117149	1	3	04/01/93	MECHANICAL SITE UTILITIES TITLE SHEET	

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION,
60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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DATE 04/02/93
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HANFORD WASTE VITRIFICATION PLANT
COORDS LISTING OF DRAWINGS FOR PKG A160

DISC	PACKAGE	DRAWING NUMBER	SHT NO.	REV	SIGNATURE DATE	DRAWING TITLE	REMARKS
30	A160	H-2-117150	1	3	04/01/93	MECHANICAL SITE UTILITIES DRAWING INDEX	
60	A160	H-2-122082	1	2	04/01/93	ELECTRICAL STANDARD ASSEMBLIES	
60	A160	H-2-122082	4	2	04/01/93	ELECTRICAL STANDARD ASSEMBLIES AND DETAILS	
60	A160	H-2-122084	1	2	04/01/93	ELECTRICAL UNDERGROUND CONDUIT AND GROUNDING PLAN	
60	A160	H-2-122085	1	2	04/01/93	ELECTRICAL UNDERGROUND CONDUIT AND GROUNDING PLAN	
60	A160	H-2-122086	1	2	04/01/93	ELECTRICAL UNDERGROUND SECTIONS	
60	A160	H-2-122088	1	2	04/01/93	ELECTRICAL PWR, GNDG, HT TR & LTNG PROT PLAN BLDG 20	
60	A160	H-2-122089	1	2	04/01/93	ELECTRICAL PWR, GNDG, HT TR & LTNG PROT PLAN BLDG 21 & 23	
60	A160	H-2-122093	1	2	04/01/93	ELECTRICAL UNDERGROUND CABLE PLAN CONSTRUCTION UTILITIES	

TOTAL: 33

Records printed: 33

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION,
60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

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DATE 04/02/93
CONTRACT 80845734

Time: 09:27 AM

HANFORD WASTE VITRIFICATION PLANT
COORDS LISTING OF SPECIFICATION FOR PKG A160

DISC	PACKAGE	SPEC NUMBER	PKG REV	SPECIFICATION TITLE	SEC REV	SECTION	SECTION TITLE	REMARKS
	A160	B-595-C-A160	2	MECHANICAL SITE UTILITIES				
60					2	16100	ELECTRICAL INSTALLATION	
60					2	16110	ELECTRICAL MATERIALS AND DEVICES	

TOTAL: 2

Records printed: 2

00/PIPING & INSTRUMENT DIAGRAMS, 05/CIVIL, 10/HVAC, 20/STRUCTURAL, 30/ARCHITECTURAL, 40/MECHANICAL, 50/PIPING, 51/FIRE PROTECTION,
60/ELECTRICAL, 70/CONTROL SYSTEMS, 90/MISCELLANEOUS

SPECIFICATIONS

**MECHANICAL SITE UTILITIES
B-595-C-A160**

HANFORD WASTE VITRIFICATION PLANT

**U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE**



**FLUOR DANIEL
ADVANCED TECHNOLOGY DIVISION
CONTRACT 8457**

**DOE CONTRACT NO.
DE-AC06-86RL10838**

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

MECHANICAL SITE UTILITIES
SPECIFICATION B-595-C-A160

APPROVED FOR CONSTRUCTION

REVISION 2 PER CR-0690

ISSUE DATE 4-1-93

APPROVED BY:

<u>M. H. Featherston</u>		<u>3/31/93</u>
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E. R. Jacobs	Area Project Manager	Date
<u>Paul J. Speidel</u>		<u>3/31/93</u>
P. J. Speidel	Engineering Project Manager	Date
<u>John Smets</u>		<u>4/1/93</u>
J. Smets	Systems Manager	Date
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A. K. Yee	Independent Safety Manager	Date
<u>Bob Kelly</u>		<u>3/31/93</u>
J. G. Kelly	Quality Assurance Manager	Date
<u>R. S. Poulter</u>		<u>3/31/93</u>
R. S. Poulter	Project Director	Date

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MECHANICAL SITE UTILITIES
SPECIFICATION B-595-C-A160

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TECHNICAL SPECIFICATIONS

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02730	Sanitary Sewer System	1
02830	Steel Chain Link Fence	1

DIVISION 3 - CONCRETE

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DIVISION 5 - METALS

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05061	Welding Tanks	1
05062	Welding Piping	1
05063	Not Used	
05120	Structural Steel	1

DIVISION 9 - FINISHES

Section	Title	
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15501	Automatic Wet Pipe Sprinkler Systems	1
15505	Fire Water Unit Tank Heater	1
15540	Fire Water System Pumps	1
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17704	Instrument Installation	1
17705	Instrument Checkout and Calibration	0
17708	Instrument Piping Pressure Testing	1
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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 16100
ELECTRICAL INSTALLATION
B-595-C-A160-16100

APPROVED FOR CONSTRUCTION

REVISION 2 PER CR-0690
ISSUE DATE 4-1-93

WAPA YES ☐ NO ☒
QUALITY LEVEL I ☐ II ☒
SAFETY CLASS 1 ☐ 2 ☐ 3 ☒ 4 ☐

ORIGINATOR:

CHECKER:

K. K. Srivastava 3/29/93
Kumar Srivastava, Electrical Eng. Date

Mona Morrow 3/29/93
Mona Morrow, Electrical Engineer Date

APPROVED BY:

K. A. Owrey
Lead Discipline Engineer

3-29-93
Date

SECTION 16100
ELECTRICAL INSTALLATION
B-595-C-A160-16100

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**SECTION 16100
ELECTRICAL INSTALLATION**

PART 1 GENERAL

1.1 SUMMARY

- 1.1.1 Seller shall furnish all labor, material, tools, and equipment necessary to perform installation of electrical equipment and systems for the mechanical site utilities as shown on the Contract Drawings and in accordance with the requirements of this specification section.
- 1.1.2 Seller shall be responsible for field routing and/or matching of equipment wiring and conduit to components where not specifically defined on the Contract Drawings.
- 1.1.3 Seller shall provide and install locknuts, union fittings, conduit extensions, reducers, etc. as required to connect equipment.
- 1.1.4 Dimensional tolerance shall be ± 1 inch unless otherwise specified on the Contract Drawings.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- | | |
|---------|-------------------------------------|
| NFPA 70 | 1990 National Electrical Code (NEC) |
| NFPA 78 | 1989 Lightning Protection Code |

UNDERWRITERS LABORATORIES, INC. (UL)

- | | |
|--------|---|
| UL 96A | 1982 Standard for Safety Installation Requirements for Lightning Protection Systems, 9th Edition - 1990 |
|--------|---|

1.3 RELATED REQUIREMENTS

- | | |
|-----------------------------|----------------------------------|
| Specification Section 13120 | Building Accessories |
| Specification Section 16110 | Electrical Materials and Devices |
| Specification Section 16111 | Conduit/Cable Schedule |
| Specification Section 16150 | Motors - Induction |

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Specification Section 16640 Cathodic Protection System
(Sacrificial Anode)

Specification Section 16642 Cathodic Protection System
(Impressed Current)

Specification Section 16905 Electrical Testing

1.4 SUBMITTALS

1.4.1 Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Subcontract.

A. As-built Drawings

B. Lightning protection system installation requirements in accordance with UL 96A

1.4.2 Submit manufacturer's instructions for installation of items identified in this specification and as shown on the Contract Drawings. Manufacturer's instructions shall include connection diagrams and additional procedures for equipment storage, handling, protection, examination, preparation and start-up.

1.4.3 Submit details of exact routing and locations of all conduits which are not shown on the Contract Drawings or when the conduit is to be rerouted due to installation interference.

1.5 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.5.1 Climatic and Geographic Site Conditions

A. Site Elevation 714 feet above sea level

B. Barometric Pressure 14.3 psia

C. Outside Design Temperature

1) Maximum Design Temperature 110°F

2) Minimum Design Temperature -20°F

1.5.2 Operating Environment

A. Fire Water Pump House

Normal Temperature 65°F to 104°F

B. Raw Water Pump House

Normal Temperature 65°F to 104°F

C. Manifold Shelter

Normal Temperature

55°F to 104°F

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Seller shall furnish all materials and equipment required to perform installation work in accordance with the Contract Drawings and specifications.

PART 3 EXECUTION

3.1 INSTALLATION, APPLICATION AND ERECTION

3.1.1 All equipment and materials shall be installed in accordance with the Contract Drawings and manufacturer's instructions furnished with equipment and materials. Installation shall conform to NFPA 70 and NFPA 78 and all applicable federal, state and local codes, regulations and ordinances.

3.1.2 Fastenings

3.1.2.1 Unless noted otherwise on the Contract Drawings, fastenings to steel shall be by means of machine screws, bolts or certified and/or Buyer approved welding method. The overall strength of fastening by any method for branch circuit panelboards DA-32A-851, 852 and 853, and dry-type transformers XT-32A-801, 802 and 213 shall be at least equal to four 3/8 inch diameter A-307 bolts. No wood or fiber plugs shall be permitted. Fastenings to concrete shall be accomplished with expansion anchors or bolts. Size/type for anchors or bolts shall be as shown on Contract Drawings.

3.1.2.2 Seller shall drill, tap, or weld to structural steel as required to mount equipment and material.

3.1.3 Conduit Supports and Equipment Racks

3.1.3.1 Seller shall supply and install electrical supports where structural supports cannot be used or are not available.

3.1.3.2 Conduit supports and equipment racks shall be furnished and installed by the Seller as shown on the Contract Drawings and/or as specified in applicable paragraphs of this section. Conduit supports shall be spaced in accordance with Paragraph 3.1.6.10.

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- 3.1.4 Openings, Penetrations, and Inserts
- 3.1.4.1 The Seller shall provide all openings required for his work except for those openings identified specifically as existing on the Contract Drawings.
- 3.1.4.2 The Seller shall seal all penetrations passing through floors, fire rated walls and where specified on the Contract Drawings in accordance with the Contract Drawings and Specification Section 13120.
- 3.1.5 Grounding
- 3.1.5.1 The grounding of electrical equipment, grounded electrical circuits, etc., shall be in accordance with the Contract Drawings. In addition to the grounding specified herein or on the Contract Drawings, all ground connections required by the National Electrical Code shall be furnished and installed. Where grounding conductor sizes are omitted from the Contract Drawings, the minimum requirements of the National Electrical Code shall apply.
- 3.1.5.2 The enclosing cases, mounting frames, etc., of all switches, circuit breakers, control panels, motors and other electrical equipment shall be grounded by a grounding conductor from a ground bus established at the source of supply to the equipment to be grounded. This grounding conductor shall be run inside the raceway enclosing the power conductors supplying the equipment. When equipment power conductors are supplied by a multi-conductor cable, a grounding conductor shall be included in the cable.
- 3.1.5.3 Grounding conductors shall be copper. Routing shall be as shown on the Contract Drawings.
- 3.1.5.4 Equipment grounding conductors shall connect to the related equipment ground bus, if provided, or equipment frame/enclosure.
- 3.1.5.5 Before connections are made, all contact surfaces shall be clean of grease, dirt and debris. Apply an approved anti-oxidizing compound to clean contact surfaces for pressure or clamp-on type ground connections.
- 3.1.5.6 Exothermic weld connections shall be made by the CADWELD Process or equal. Ground connections shall include but not be limited to, all cable to cable splices, tees, X's, etc., all cable to ground rods, ground rod splices, cable to steel or cast iron and cable lug terminations as shown on the Contract Drawings.
- 3.1.5.7 Nonelectrical equipment, such as structural steel supports, shall be grounded in accordance with the Contract Drawings.

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3.1.5.8 Instrument Cable Shields

3.1.5.8.1 Instrument cable shields shall be grounded at one end only.

3.1.5.8.2 Shield grounding of instrument signal (mA, mV) conductors shall be electrically and mechanically isolated from all other grounding conductors or grounded surfaces.

3.1.5.8.3 Ground buses shown as "isolated" on the Contract Drawings shall be the only ground buses on which instrument ground conductors may be terminated.

3.1.5.9 Lighting Fixture Enclosure Grounding

3.1.5.9.1 An insulated continuous ground conductor shall be run in the same conduit as the circuit conductors and attached to the metal enclosure of each lighting fixture, local switch box and receptacle box.

3.1.6 Conduits

3.1.6.1 Minimum conduit size shall be 3/4 inch exposed or embedded.

3.1.6.2 Above ground conduit shall be Intermediate Metal Conduit (IMC) unless noted otherwise on the Contract Drawings. Maximum IMC size shall be 4 inches.

3.1.6.3 Conduits installed below grade shall be Polyvinyl Chloride (PVC) Schedule 80. Minimum size shall be 2 inches.

3.1.6.4 Flexible connections shall be six feet or shorter, except as noted on the Contract Drawings. Liquid-tight flexible conduit shall be used for final connections to all motors, field instruments and control panels. Slack of 1" to 3" shall be provided to allow for potential seismic motion.

3.1.6.5 Conduit shall not be secured directly to piping. Minimum separation of conduit parallel to or crossing uninsulated hot water or steam pipes shall be 12 inches if parallel, or 6 inches if crossing. Conduit parallel to or crossing insulated water lines must be separated from the insulation surface of the water lines in either direction by at least 3 inches.

3.1.6.6 Intermediate metal conduit shall be cut square with a conduit cutter and threaded with a conduit threader. The ends shall be reamed of burrs and all metal shavings and cutting lubricants shall be removed before the conduit is connected to the conduit system.

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- 3.1.6.7 Bends and offsets shall be avoided wherever possible; but where they are necessary, they shall be made with a bending device. In no case shall the radius of any conduit bend be less than that specified in the National Electrical Code or less than the allowable bending radius of the installed conductors. Any conduit crushed or deformed in bending will be rejected. Concentric bends are not required; however, the Seller shall maintain identical spacing between adjacent conduit runs both at the beginning and after the bend.
- 3.1.6.8 Intermediate metal conduit whether concealed or exposed, shall be adequately supported in accordance with Section 345-12 of the National Electrical Code and the Contract Drawings.
- 3.1.6.9 Conduit shall be secured to walls, building framing, etc. by the use of malleable iron galvanized U bolts, conduit clamps, conduit straps or channel fittings where channel racks or supports are used. Conduit support hardware shall be installed per manufacturer's instructions and shall be tightened to the steel to provide maximum clamping action. Conduit shall be securely fastened to all outlet boxes with double locknuts and insulating bushings unless boxes with conduit hubs are provided.
- 3.1.6.10 Supports shall be erected square, and true to line and grade, with a minimum spacing of one support for every 10 feet of conduit length. Also, one support shall be provided within 3 feet of each conduit terminal fitting or box, except where details on the Contract Drawings require closer spacing.
- 3.1.6.11 Conduit connections shall be made with appropriate fittings and securely tightened. Improperly made connections or terminations, as well as any which have not been tightened, will be rejected.
- 3.1.6.12 Conduit openings into which dirt, plaster, mortar mix or debris may fall shall be closed with caps or tight-fitting plugs during the construction period. Conduits in which such material has accumulated shall be thoroughly cleaned. Where such accumulations cannot be readily removed, the conduit shall be replaced.
- 3.1.6.13 Liquid-tight flexible metal conduit assemblies shall be used between motor terminal boxes, transformers, and other equipment subject to vibration and/or mechanical adjustment and the rigid conduit systems or elsewhere as shown on the Contract Drawings. Liquid-tight conduit used to connect to motor terminal boxes for housing motor conductors shall be not less than twelve inches in length.
- 3.1.6.14 Vertical drops to equipment in open spaces shall be supported from the equipment foundation as shown on the Contract Drawings and/or as required by the National Electrical Code. Supporting of conduit from equipment is not allowed.

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3.1.6.15 When not shown in detail on the Contract Drawings or when installation interference exists, the exact locations and routing of conduit shall be determined by the Seller and approved by the Buyer.

3.1.6.16 Spacing between parallel conduit runs of different services shall be maintained as indicated below:

<u>Voltage Level</u>	<u>Analog Signal <50V and Digital</u>	<u>Analog Signal >50V</u>
120 V	12"	9"
480 V	12"	9"

3.1.6.17 Fittings on conduit systems having threaded connections shall be made up tight, with full thread engagement, and with a minimum of wrench work in order to avoid wrench cuts. Running threads and slip joints are not permitted. Joints shall provide structure rigidity and low electrical resistance across the joints. All open conduit ends shall have bushings unless other terminations are shown on the Contract Drawings.

3.1.6.18 Polyvinyl Chloride (PVC) conduit shall be joined using PVC conduit couplings and a solvent cement specifically recommended by the manufacturer.

3.1.6.19 All parts of the conduit system shall be protected against damage during construction. Conduits shall be securely fixed in position to avoid displacement due to other construction activities, and Seller shall maintain conduits in their required positions until the work is accepted.

3.1.6.20 Before making up conduit runs, the interiors of all conduit, conduit bends and fittings shall be inspected and cleaned of all dirt, cuttings and other foreign material.

3.1.6.21 Unused knockouts shall remain closed or shall be sealed with knockout closures.

3.1.6.22 A No. 12 insulated copper fish wire (or 240 pound tensile strength polypropylene pull line) shall be installed in all conduits for which conductors are not installed by the Seller. A 10 inch length of the fish wire (pull line) shall extend out of each end of all conduits.

3.1.7 Wire and Cable

3.1.7.1 Wire and cable shall not be pulled until the conduit system is complete from pull point to pull point.

- 3.1.7.2 Care shall be exercised while installing wire in conduits so as not to damage the conductor insulation. Pulling compounds may be used in pulling conductors and shall be used if wire and cable are pulled by mechanical means.
- 3.1.7.3 Wire and cable as it is pulled, shall be visually inspected by the Seller. If any rubbing due to friction or cuts in the insulation, kinks and lumps are found, the Seller shall suspend pulling and report the cable's condition to the Buyer.
- 3.1.7.4 Lighting and power circuits required for construction shall be installed in a safe manner and removed when the work is complete.
- 3.1.7.5 Mandrel and swab shall be pulled through conduit prior to pulling wire and cable into conduit. Lubricant may be blown into conduits to facilitate pulling of wire and cables, but grease or other materials harmful to insulation shall not be used.
- 3.1.7.6 Pulling tension shall be monitored by a tension dynamometer or similar device whenever a mechanical or electrical cable puller is used. If pulling tensions exceed values recommended by wire and cable manufacturer, Seller shall suspend pulling until further procedure has been approved by the Buyer.
- 3.1.7.7 Terminations shall generally be made using insulated ring tongue compression type lugs for all conductors other than for lighting circuits, where the wire shall be formed to the terminal connection. Connections at motor leads, transformers, and other similar connections to insulated leads or busses, shall be covered and taped in a manner appropriate to the class of insulation originally on the conductor, with the taping extended over the terminal connector fitting and the terminal of the device to which the conductor attaches.
- 3.1.7.8 At panels and other enclosures, an allowance shall be made in conductor length to permit forming the conductors neatly within the enclosures. Where wiring troughs are not provided with the enclosures, the wiring shall be neatly cabled and adequately supported.
- 3.1.7.9 Power and control conductors shall be tested for continuity before connections are made at terminals. Polarity, phasing and rotation shall be checked and changes made as required before terminal connections are made.
- 3.1.7.10 Control, alarm, and indication conductor terminations shall be made in accordance with Contract Drawings.

- 3.1.7.11 Splices in power and control conductors shall not be permitted except where specifically indicated on the Contract Drawings or authorized in writing by Buyer. Splices shall be made by the Seller for each type of wire in accordance with instructions issued by wire manufacturer.
- 3.1.7.12 On splices and taps the tape applied directly over the connector shall be wrapped as tight as possible in a manner so as to pad the sharp edges and fill the indents of the connector. The outer tape shall be applied until the total area of the initial taping is covered with a minimum of four layers. The total thickness of the combination of tapes shall be in accordance with manufacturer's recommendations.
- 3.1.7.13 Conductors shall be pulled into conduits in such manner as to avoid sharply bending or kinking conductor, damaging or stressing insulation. Minimum cable bending radius shall not be smaller than that specified by the manufacturer.
- 3.1.7.14 Shields and drain wires shall be terminated (grounded) as shown on the Contract Drawings. Field end of shield and drain wire shall be insulated per details on the Contract Drawings to prevent accidental grounding.
- 3.1.7.15 Color Coding
- 3.1.7.15.1 Grounded (neutral) conductors No. 2 AWG and smaller shall have pigmented insulation. Grounded conductors larger than No. 2 AWG shall be identified at all terminals or junction points by wrapping with self-adhesive, vinyl plastic electrical tape. Color coding shall be as described below. Sufficient length of cable nearest terminal or junction point shall be easily identifiable when covers of lighting panels, transformers, junction boxes, safety switches, etc., are removed.
- 3.1.7.15.2 Conductors for 480Y/277 volt three phase systems shall be color coded (pigmented insulation) as follows: Phase A (Brown), Phase B (Orange), Phase C (Yellow), Grounded Neutral (Gray), Grounding Conductor (Green).
- 3.1.7.15.3 Conductors for 208Y/240 volt three phase systems shall be color coded (pigmented insulation) as follows: Phase A (Black), Phase B (Red), Phase C (Blue), Grounded Neutral (White), Grounding Conductor (Green).
- 3.1.7.15.4 Conductors for 120/240 volt single phase systems shall be color coded (pigmented insulation) as follows: Ungrounded conductor (Red), Ungrounded Conductor (Black), Grounded Neutral (White), Grounding Conductor (Green).

- 3.1.7.15.5 Any insulated conductor intended solely for grounding purposes shall be identified by a continuous green color.
- 3.1.7.16 Splices, Taps, and Connectors
- 3.1.7.16.1 Splices and taps shall be made in junction boxes or other National Electrical Code approved enclosures.
- 3.1.7.16.2 Compression connectors shall be installed in strict accordance with manufacturer's instructions, using properly sized and keyed connectors and dies.
- 3.1.8 Lighting System
- 3.1.8.1 Fixtures
- 3.1.8.1.1 Lighting fixtures shall be installed at locations shown on the Contract Drawings. Fixture installation shall be in accordance with the manufacturer's instructions or as detailed on the Contract Drawings and specifications.
- 3.1.8.1.2 Rows of fixtures shall be installed accurately as to line and level. Fastenings and supports shall be set so that the fixtures will not be distorted by handling during normal maintenance. All parts including lamps shall be secured to prevent falling or dislocation.
- 3.1.8.2 Receptacles and Switches
- 3.1.8.2.1 Switch and receptacle boxes concealed in the non-concrete construction shall be firmly secured in place, set true, square and flush with the finished surfaces for the application of the appropriate cover plate.
- 3.1.8.2.2 Unless shown otherwise on the Contract Drawings, outlets shall be located as listed below with measurements taken to the bottom of outlets.
- A. Receptacles - 18 inches from floor.
- B. Switches - 54 inches from floor.
- 3.1.8.2.3 Switch and receptacle boxes shall be mounted vertically, unless otherwise noted on the Contract Drawings.
- 3.1.8.2.4 Junction boxes, terminal boxes, pullboxes and conduit fittings required by the National Electrical Code or required to facilitate spreading and/or pulling conductors (either feeders or branch circuits) shall be furnished regardless of whether shown on the Contract Drawings or not.

- 3.1.8.2.5 Boxes shall be rigidly secured in position to building structures. Boxes, except on unfinished ceiling and walls, shall be set so that the front of each of the boxes or covers shall be flush with the finished surface.
- 3.1.9 Identification
- 3.1.9.1 Equipment
- 3.1.9.1.1 Disconnect switches, terminal boxes and cabinets, circuit breakers, combination motor controllers, 480V power receptacles, and other similar electrical equipment shall be identified by means of phenolic laminated nameplates. The nameplate inscription shall include the equipment number as a minimum and shall be in accordance with the Contract Drawings or equipment specification. Nameplates shall be in accordance with Specification Section 16110.
- 3.1.9.1.2 Cardholders and directory cards shall be provided for circuit identification in panelboards. List of circuits shall be type-written. Circuit description shall include equipment or areas served and/or location of equipment as described in Panel Schedules listed on the Contract Drawings.
- 3.1.9.2 Cables
- 3.1.9.2.1 Cables shall be identified in accordance with Conduit/Cable Schedule Specification Section 16111. Identification shall be by means of heat shrinkable plastic with cable number printed on heat shrink sleeve.
- 3.1.9.2.2 Cable numbers shall be applied at each cable termination and inside terminal enclosures where present.
- 3.1.9.2.3 Underground cables shall be protected by wood boards, as shown on the Contract Drawings.
- 3.1.9.3 Underground Cable Marker
- Install underground cable marker with arrow parallel to and facing underground run. Arrows shall point from the source to the point of utilization. Markers shall be placed one foot from the edge of the underground run and placed at 150 foot intervals on straight runs. At each turning point or tee, one marker shall be placed for each direction the cable or duct takes at that point.
- 3.1.9.4 Conduits
- 3.1.9.4.1 Conduits listed on the Conduit/Cable Schedule Specification Section 16111 shall be identified with self-adhesive vinyl cloth in accordance with Specification Section 16110.

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- 3.1.9.4.2 Conduits shall be identified at the entry and exit points of all junction or pullboxes, T-fittings, on both sides of any walls or floors which conduits penetrate and at equipment in which they terminate as shown on the Contract Drawings.
- 3.1.10 Heat Tracing
- 3.1.10.1 Installation shall be in accordance with the manufacturer's instructions, the Contract Drawings and the requirements included in this specification.
- 3.1.10.2 The surface on which the heater cable is to be installed shall be wiped clean of any loose foreign material (scale, rust, dirt, etc.).
- 3.1.10.3 Heater cable shall be secured to the pipe with glass or aluminum tape as indicated on the Contract Drawings.
- 3.1.10.4 Power connection to the heater cable shall be made with connection kit supplied with heater cable.
- 3.1.10.5 Control and monitoring thermostat shall be installed as indicated on the Contract Drawings.
- 3.1.10.6 Pilot light assembly shall be installed at both ends of each heat tracing run to indicate voltage continuity.
- 3.1.11 Motor Controllers
- 3.1.11.1 Location and method of securing combination motor controllers shall be done in accordance with manufacturer's instructions and approved drawings, Specification Section 16110 and the Contract Drawings.
- 3.1.11.2 Combination motor controllers shall be carefully assembled from shipped parts and accurately positioned, leveled, and anchored in place. Shims shall be installed as required in leveling to prevent stress or distortion in the equipment.
- 3.1.11.3 Interconnections, including power, control and ground buses, and interpanel wiring, shall be carefully remade and insulated as required. Bolted or clamped joints shall be drawn up to torque values defined by manufacturer.
- 3.1.11.4 Combination motor controllers shall be bolted to the structural support systems as indicated on the Contract Drawings.

3.1.12 Dry-Type Transformers

3.1.12.1 Transformers shall be mounted as indicated on the Contract Drawings. Location and method of securing transformers shall be done in accordance with this specification, manufacturer's instructions and approved drawings, equipment specification and the Contract Drawings.

3.1.12.2 Power, ground, and neutral connections shall be made in accordance with manufacturer's instructions. Bolt-on clamped joints shall be drawn up to torque values defined by the manufacturer.

3.1.13 Panelboards

3.1.13.1 Panelboard assemblies shall be installed with the position of the highest device not exceeding 6-1/2 feet above the floor. See the Contract Drawings for mounting. Cabinets shall have fronts straight and plumb.

3.1.13.2 Panelboards shall be factory assembled and tested.

3.1.14 Terminal Cabinets

3.1.14.1 Location and method of securing terminal cabinets shall be in accordance with this specification, manufacturer's instructions and the Contract Drawings.

3.1.15 Underground Duct Bank

3.1.15.1 Underground duct banks shall consists of Schedule 80 PVC conduit and ground wire encased in concrete as shown on the Contract Drawings. Slope conduits to manholes with a grade of 3 inches per 100 feet. Adjust final slopes on site to coordinate with other utilities. Joints in conduit shall be water-tight.

3.1.15.2 Minimum depth for duct banks shall be 2'-6" except as noted on the Contract Drawings.

3.1.15.3 Terminate conduits with end bells, flush with the inside wall of the manhole.

3.1.15.4 Clean duct before installing. Plug conduit ends to prevent entry of dirt, concrete, mud and other foreign material during construction.

3.1.15.5 Changes in direction of duct exceeding 10 degrees shall be accomplished with long-radius bends having a minimum of 2'-5" radius. Long-radius manufactured bends may be used at the ends of runs shorter than 100 feet.

3.1.15.6 Stagger duct joints in concrete encasement a minimum of 6 inches.

3.1.15.7 After underground conduit runs have been completed, pull a test mandrel and wire brush through each conduit to check alignment and remove foreign matter.

3.1.16 Precast Manholes and Pull Boxes

3.1.16.1 Install manholes and pull boxes in accordance with manufacturer's recommendations and as shown on the Contract Drawings.

3.1.16.2 Seal joints between manhole sections, using plastic sealing compound in conformance with manufacturer's recommendations.

3.1.17 Lightning Protection

3.1.17.1 Installation of the lightning protection shall be done in accordance with the requirements of NFPA 78, Lightning Protection Code, this specification and the Contract Drawings.

3.1.17.2 Installation of the lightning protection shall consist of a complete system of air terminals, interconnect conductors, ground test wells, down conductors, ground terminals, ground loops and other connectors or fittings required to complete the system as shown on the Contract Drawings.

3.2 FIELD QUALITY CONTROL

Electrical materials and equipment shall be inspected and tested in accordance with Specification Section 16905, Electrical Testing.

3.3 CLEANING

3.3.1 Clean and remove all debris, excess material and equipment from the job site after completion of installation.

3.3.2 Clean electrical parts to remove conductive and deleterious materials. Remove dirt and debris from enclosures and fixtures.

3.3.3 Clean and repair galvanized surfaces damaged during preparation, welding or installation with a galvanizing compound in accordance with manufacturer's instructions.

3.4 PROTECTION

3.4.1 The Seller shall be responsible for receiving, storing and site handling of all Seller furnished equipment and materials.

- 3.4.2 During installation operations, protect from damage all existing facilities, equipment and materials. Existing facilities, equipment or materials which are damaged during the installation operations, shall be repaired at Seller's expense in accordance with contract terms and conditions.
- 3.4.3 Where the corrosion protective finish on any material or equipment is removed by machining, welding, or by accident, the original finish shall be restored by an application of compatible protective finish.

END OF SECTION

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 16110
ELECTRICAL MATERIALS AND DEVICES
B-595-C-A160-16110

APPROVED FOR CONSTRUCTION

REVISION 2 PER CR-0690
ISSUE DATE 4-1-93

WAPA	YES	___	NO	<u>X</u>
QUALITY LEVEL	I	___	II	<u>X</u>
SAFETY CLASS	1	___	2	___
	3	<u>X</u>	4	___

ORIGINATOR:

K. K. Srivastava 3/29/93
Kumar Srivastava, Electrical Eng. Date

CHECKER:

Mona Morrow 3/29/93
Mona Morrow, Electrical Engineer Date

APPROVED BY:

W. A. Owrey
W. A. Owrey Lead Discipline Engineer

3-29-93
Date

SECTION 16110
 ELECTRICAL MATERIALS AND DEVICES
 B-595-C-A160-16110

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	DRY-TYPE TRANSFORMERS
B	ELECTRICAL PANELBOARDS

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**SECTION 16110
ELECTRICAL MATERIALS AND DEVICES**

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for furnishing and delivery of electrical equipment, materials and devices for the mechanical site utilities.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

**AMERICAN ASSOCIATION OF STATE HIGHWAY AND
TRANSPORTATION OFFICIALS (AASHTO)**

AASHTO HB-14 1989 Standard Specification for Highway
Bridges

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 318 1989 Building Code Requirements for
Reinforced Concrete and Commentary

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C57.12.70 1978 Terminal Markings and Connections
for Distribution and Power Transformers

ANSI C57.12.50 1981 Ventilated Dry-Type Distribution
Transformers, 1 to 500 kVA, Single-Phase,
and 15 to 500 kVA, Three-Phase, with
High-Voltage 601 to 34500 Volts, Low-
Voltage 120-600 Volts (R-1989)

ANSI C78.41 1987 Electric Lamps - Low Pressure Sodium
Lamps

ANSI C82.2 1984 Standards for Fluorescent Lamps -
Ballasts-Method of Measurement

ANSI C82.9 1988 High Intensity Discharge and Low
Pressure Sodium Lamps, Ballasts, and
Transformers - Definitions

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ANSI MC96.1 1982 Temperature Measurement
 Thermocouples

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A475 1989 Standard Specification for Zinc-
 Coated Steel Wire Strand

ASTM A615 1990 Standard Specification for Deformed
 and Plain Billet-Steel Bars for Concrete
 Reinforcement

ASTM A706 1990 Standard Specification for Low Alloy
 Steel Deformed Bars for Concrete
 Reinforcement

ASTM B3 1990 Standard Specification for Soft or
 Annealed Copper Wire

ASTM B8 1990 Standard Specification for
 Concentric-Lay-Stranded Copper
 Conductors, Hard, Medium-Hard, or Soft

ASTM B187 1986 Standard Specification for Copper
 Bus Bar, Rod and Shapes

ASTM C33 1990 Standard Specification for Concrete
 Aggregates

ASTM C150 1989 Standard Specification for Portland
 Cement

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 1985 Enclosures for Electrical Equipment
 (1000 Volts Maximum) Revision 2 - 1988

NEMA AB1 1986 Molded Case Circuit Breakers and
 Molded Case Switches

NEMA ICS4 1983 Terminal Blocks for Industrial Use

NEMA OS1 1989 Sheet-Steel Outlet Boxes, Device
 Boxes, Covers and Box Supports

NEMA PB1 1990 Panelboards

NEMA ST20 1986 Dry-Type Transformers for General
 Applications

NEMA WC5	1973 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA WC7	1988 Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA WD1	1983 General Requirements for Wiring Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	1990 National Electrical Code (NEC)
NFPA 78	1989 Lightning Protection Code

UNDERWRITERS LABORATORIES, INC. (UL)

UL 13	1990 Power-Limited Circuit Cables
UL 44	1983 Rubber Insulated Wires and Cables
UL 50	1990 Cabinets and Boxes
UL 67	1988 Panelboards
UL 96	1985 Lightning Protection Components, Third Edition, December 5, 1988
UL 360	1986 Liquid-Tight Flexible Steel Conduit
UL 467	1984 Grounding and Bonding Equipment
UL 486A	1989 Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 489	1986 Molded-Case Circuit Breakers and Circuit-Breaker Enclosures
UL 510	1986 Insulating Tape
UL 514B	1989 Fittings for Conduit and Outlet Boxes
UL 651	1989 Schedule 40 and 80 Rigid PVC Conduit
UL 1059	1988 Terminal Blocks, Second Edition - 1989

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UL 1242	1983 Intermediate Metal Conduit, First Edition-1991
UL 1277	1989 Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
UL 1561	1991 Dry-Type General Purpose and Power Transformers
UL 1581	1983 Reference Standard for Electrical Wires, Cables and Flexible Cords

1.3 RELATED REQUIREMENTS

Specification Section 01730	Operation and Maintenance Data
Specification Section 16100	Electrical Installation
Specification Section 16111	Conduit/Cable Schedules
Specification Section 16905	Electrical Testing
Specification Section 02220	Excavation and Backfill

1.4 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.4.1 Catalog and Manufacturer's Data

Catalog and manufacturer's data shall be submitted for the following:

- A. Anti-oxidizing compound
- B. Ballasts
- C. Cable pulling lubricant
- D. Cable ties
- E. Combination motor starters
- F. Conduit
- G. Conduit fittings
- H. Conduit support devices and hardware

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- I. Copper conductor terminations
- J. Grounding materials
- K. Heat tracing materials and devices
- L. Identification bands and tags
- M. Pull boxes
- N. Lighting fixtures
- O. Power factor correction capacitors
- P. Receptacles
- Q. Sealant
- R. Switches
- S. Terminal blocks
- T. Terminal cabinets and relay panels
- U. Utility boxes
- V. Utility chain
- W. Wire connectors
- X. Wiring ducts
- Y. Concrete Manholes
- Z. Concrete Pullboxes
- AA. Lightning Protection Materials

1.4.2 Physical characteristics of cable including the following:

- A. Details of construction for each different type of wire
- B. Overall wire diameter
- C. Insulation thickness (average minimum and average maximum)
- D. Thickness and color of jacket

1.4.3 A copy of the UL listing cards certifying that cable is in compliance with the UL standards referenced in this specification section.

- 1.4.4 Cable manufacturer's installation instructions including the following:
- A. Maximum sidewall pressure
 - B. Maximum pulling tension
 - C. Permanent/temporary bending and turning radius
 - D. Acceptable splicing methods and materials
 - E. Pulling lubricant compatibility
- 1.4.5 Data Sheets
- Submit product data sheets for transformers, cable connectors, bus connectors, panelboards, and circuit breakers.
- 1.4.6 Shop Drawings
- 1.4.6.1 Submit detailed shop drawings for transformers including the following:
- A. Dimensioned plans
 - B. Elevations
 - C. Total operating weight
 - D. Location of overall center of gravity
 - E. Base frame details
 - F. Locations of conduit entrance to primary and secondary terminal chambers
 - G. Locations of removable plates
 - H. Locations and sizes of anchor bolts
 - I. Electrical ground lugs
 - J. Point-to-point wiring diagrams
 - K. Anchorage details
- 1.4.6.2 Submit detailed shop drawings for panelboards including the following:

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- A. Dimensional plan, front and end view of each panelboard enclosure supporting frame structure and sheet metal thickness of enclosure
- B. Conduit entrance locations and dimensions for both top and bottom entrance
- C. Detail drawings showing typical mounting details and section view including wiring trough location and dimensions
- D. Neutral and ground connections
- E. Weight of each panelboard
- F. Connection diagram of individual panelboards with location of each circuit breaker indicated

1.4.7 Test Reports

1.4.7.1 Submit test procedures for Buyer's approval.

1.4.7.2 Submit Certified Factory Acceptance Test Reports for transformers in accordance with ANSI Standard C57.12.50

1.4.8 Installation Instructions

Submit manufacturer's installation instructions.

1.4.9 Manufacturer's Drawings

Lighting fixture drawings shall include dimensions, effective projected area, accessories, and installation and construction details. Drawings shall also include photometric data, including zonal lumen data, and candlepower distribution data.

1.4.10 Operation and maintenance data in accordance with Specification Section 01730, Operation and Maintenance Data.

1.4.11 Submit a statement that lightning protection materials and components conform to the requirements for UL 96, Master Labels.

1.5 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.5.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level
- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature

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1) Maximum Design Temperature 110°F

2) Minimum Design Temperature -20°F

1.5.2 Operating Environment

A. Fire Water Pump House

Normal Temperature 65°F to 104°F

B. Raw Water Pump House

Normal Temperature 65°F to 104°F

C. Manifold Shelter

Normal Temperature 55°F to 104°F

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Conduit

2.1.1.1 Intermediate Metal Conduit

Intermediate metal conduit shall be in accordance with UL 1242.

2.1.1.2 PVC Conduit

PVC conduit shall be Schedule 80 in accordance with UL 651.

2.1.1.3 Liquid-Tight Flexible Metal Conduit

Liquid-tight flexible metal conduit shall be fabricated of galvanized steel flexible tubing with a synthetic polyvinyl chloride (PVC) jacket extruded over the tubing. Jacket shall be positively locked to steel tubing to prevent sleeving. Liquid-tight flexible metal conduit shall be in accordance with UL 360.

2.1.2 Enclosures

2.1.2.1 Pull Boxes

Pull boxes shall be sized as indicated on the Contract Drawings. Where not specifically sized on the Contract Drawings, all boxes shall be sized in accordance with the National Electrical Code. Boxes and box covers shall be fabricated from sheet steel of gauges defined by National Electrical Code. Boxes shall be in accordance with NEMA OS1 and UL 50.

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- 2.1.2.2 Control and Instrument Terminal Cabinets and Relay Panels
- 2.1.2.2.1 Control terminal cabinets and relay panels shall be NEMA 12 enclosures with terminal mounting panel and ground bus except where indicated on the Contract Drawings; Hoffman Bulletin A-12 or equal. Terminal cabinets smaller than 16 x 12 x 6 inches shall be Hoffman Bulletin A-51 or equal. Ground terminal kits in cabinets shall be GE Catalog Type TGL or equal.
- 2.1.2.2.2 Instrument terminal cabinets shall be NEMA 12 enclosures with terminal mounting panel and EMI/RFI shielding except where indicated on the Contract Drawings; Hoffman Bulletin A-13 or equal. Terminal cabinets smaller than 16 x 12 x 6 inches shall be Hoffman Bulletin A-53 or equal. Ground terminal kits in cabinets shall be GE Catalog type TGL or equal.
- 2.1.3 Conduit Fittings
- 2.1.3.1 Cast malleable iron or steel conduit fittings used with intermediate metal conduit shall be thoroughly coated with metallic zinc or cadmium inside and outside after all machine work is completed and in accordance with UL 514B. Appleton Form 35 or equal. LB type fittings for 1-1/2 inch and larger conduit shall be Appleton LBD and LBDN or equal.
- 2.1.3.2 Mogul fittings shall be malleable iron with cadmium finish. Covers shall be from the same material as fittings, and shall be raised to allow additional wiring area. Appleton Series Moguls or equal.
- 2.1.3.3 Fittings used with liquid-tight flexible metal conduit shall be malleable iron/steel construction, electro zinc plated inside and outside, furnished with nylon insulated throat, taper threaded hub, and an external ground lug. Appleton Series STB or equal.
- 2.1.3.4 Nonmetallic insulating type bushings used on intermediate metal conduit shall be Appleton Type BBU or equal.
- 2.1.3.5 Metallic insulating type bushings used on intermediate metal conduit shall be Appleton Type BU or equal. Appleton Type BUC or equal.
- 2.1.3.6 Conduit drains shall be stainless steel, standard type and in accordance with UL 514B. Appleton ECDB or equal.
- 2.1.3.7 Conduit union fittings shall be steel (1/2 inch - 1 inch) or steel alloy (1-1/4 inch - 6 inch) with zinc-electroplated finish and in accordance with UL 514B. Appleton UNY and UNF or equal.
- 2.1.3.8 Conduit reducers shall be steel or steel alloy with zinc-electroplated finish. Appleton RB or equal.

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2.1.4 Conduit Support Devices and Hardware

2.1.4.1 Conduit shall be supported by clamps and/or straps in accordance with the Contract Drawings and the National Electrical Code.

2.1.4.2 Conduit supports unless otherwise noted on the Contract Drawings shall be fabricated of 12 gauge (1-5/8 inch by 1-5/8 inch) metal framing channels: Unistrut P-1000 (pre-dipped galvanized) with Unistrut P-1000 series (electrogalvanized) pipe clamps or equal.

2.1.4.3 Conduit clamps shall be malleable iron type with hot dip galvanized finish. Appleton Series PC or equal.

2.1.4.4 Conduit straps shall be one hole malleable iron strap and clamp back for 1/2 inch to 1 inch. Appleton CL and CLB for IMC or equal. Two hole steel strap (heavy duty) - 1-1/4 inches and up shall be Appleton Series CF or equal.

2.1.5 Copper Conductor Terminations

2.1.5.1 Termination of electronic cable conductors shall be made with tin plated, copper compression, ring tongue, nylon, self-insulated terminals. Terminals shall be in accordance with UL 486A. Thomas and Betts Series RA for #22-18 AWG, RB for #16-14 AWG or equal.

2.1.5.2 Termination of circuits with two or three conductors per phase shall be made with two or four hole copper alloy solderless lugs. Burndy Type Q2A and Q3A or equal.

2.1.5.3 Termination of instrument pigtail leads and splicing of control and ground wires shall be made with insulated pressure connectors. Thomas and Betts "Sta-Kon" or equal.

2.1.5.4 Termination of 600 volt power conductors smaller than #8 AWG shall be made with tin plated, copper compression type lugs, bolted and taped. Lugs shall be in accordance with UL 486A. Connection for conductors smaller than #8 AWG shall be made with Thomas and Betts "Sta-Kon" Series "C" for #12-10 AWG or equal.

2.1.5.5 Termination and/or splicing of lighting leads shall be made with crimp type joint with hand twist type, tapered spring lock and nylon insulator skirt. Terminals shall be in accordance with UL 486A. Thomas and Betts "Piggy" wire joints, Catalog Type PT or equal.

2.1.5.6 Termination of control leads on screw terminals shall be made with tin plated, copper compression, ring tongue, fork, nylon, self-insulated terminals. Terminals shall be in accordance with UL 486A. Thomas and Betts Series RA for #22-18 AWG, RB for #16-14 AWG or equal with bolt holes to suit application.

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- 2.1.5.7 Splices and taps in 600 volt power conductors No. 8 AWG and larger and terminations in equipment lugs (i.e., molded case circuit breakers) shall be made with wrought copper compression connectors.

TYPE OF CONNECTION	TYPE OF CONNECTOR	THOMAS AND BETTS SERIES NO. OR EQUAL
Splice	Two-Way Connector	54500
Tap	"C" Tap	54700
Termination	One-Hole Lug (#8 - #1 AWG)	54100
	Two-Hole Lug (#1/0 - 4/0)	54200
	Two-Hole Lug (250 MCM and larger)	53210

2.1.6 Terminal Blocks

Terminal blocks shall be provided and mounted in junction boxes and terminal cabinets as indicated on the Contract Drawings with each cabinet containing 20 percent spare terminals but not less than two spare terminals for each terminal strip. Terminal blocks shall be channel mounting type rated 600 volts with screw type terminals on both sides. Terminal blocks shall be in accordance with NEMA ICS4 and UL 1059. Buchanan Catalog Number P0721 or equal.

2.1.7 Wiring Ducts and Cable Ties

- 2.1.7.1 Spiral wrapping for wiring across hinged doors and similar applications shall be flame retardant polyethylene. Panduit Part Number T12R, T25R, T50R or equal.

- 2.1.7.2 Cable ties for bundling of cables in panels, terminal cabinets wireways, cable trays, etc., shall be nylon, self-locking type. Thomas and Betts Catalog Number TY-RAP or equal.

2.1.8 Identification

2.1.8.1 Wire and Cable

- 2.1.8.1.1 Identification of instrument, control, and power circuits shall be by means of heat shrinkable, polyolefin with circuit number identification by computer printed characters on white heat shrink sleeve; Brady Catalog Number B321 or equal.

- 2.1.8.1.2 Electrical tape for color coding of conductors shall be 3/4 inch wide, vinyl plastic and in accordance with UL 510. 3M Company Scotch 35 or equal.

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2.1.8.2 Conduits

- 2.1.8.2.1 Identification of conduits shall be by means of self-sticking vinyl cloth, black identification on an orange background, as manufactured by Brady Catalog No. B-502 or equal. Label length shall be as indicated below:

CONDUIT TRADE SIZE	BAND LENGTH	CHARACTER SIZE
3/4" to 1-1/4"	8"	1/2"
1-1/2" to 6"	8"	3/4"

2.1.8.3 Equipment

Equipment, devices and terminal boxes shall be identified with phenolic nameplates. Nameplates shall be white with black engraving as identified in accordance with the Contract Drawings.

2.1.9 Switches

Specific types of switches to be installed shall be noted on the Contract Drawings.

2.1.9.1 Three Way Toggle Switch #S21

Switch shall be an ivory handle, toggle type, 3-way, 120 V/277 V, 20 ampere. Hubbell Catalog Number 1223-I or equal with steel plate and stainless screws for FS type box, Appleton #FSK-1TS, #FSK-2TS or equal as required on the Contract Drawings.

2.1.9.2 Single Pole Toggle Switch #S17

Switch shall be an ivory handle, toggle type, single pole, 120 V/277 V, 20 ampere. Hubbell Catalog Number 1221-I or equal with steel plate and stainless steel screws for FS type box, Appleton #FSK-1TS or #FSK-2TS or equal as required on the Contract Drawings.

2.1.10 Receptacles

Receptacles shall have NEMA configurations in accordance with NEMA WD1. Specific types of receptacles to be installed shall be as noted on the Contract Drawings.

2.1.10.1 Duplex Receptacles #R2

Receptacle shall be a duplex, ivory grounded type, 125 volt, 20 ampere, 3-wire, 2-pole NEMA 5-20R. Hubbell Catalog Number 5262-1 or equal with steel plate for FS type box, Appleton #FSK-1DR, #FSK-2DR or equal.

2.1.10.2 Power Receptacles #R14

Receptacle shall be 4-pole, 3-wire, 480 volt, 60 ampere circuit breaking type, weatherproof, grounding Style 2. Appleton #ADRE 6034-125 or equal.

2.1.11 Motor Controller

2.1.11.1 Combination motor controllers shall consist of 480 volt, 3 phase, 60 Hz, full voltage non-reversing magnetic motor starter with ambient compensated thermal overload relay. Starter shall be equipped with a Motor Circuit Protector (MCP) type circuit breaker with adjustable magnetic trip elements, 480 V-120 V fused control power transformer sized to supply door mounted or push buttons as indicated on the Contract Drawings. Motor starters shall be single speed and sized as shown on the Contract Drawings. Westinghouse Series A200 or equal. Motor controller shall be wired in accordance with the Contract Drawings.

2.1.11.2 Each motor controller shall be identified by a laminated phenolic nameplate attached with screws. Nameplates shall have 3/4 inch high etched black lettering on white background. Nameplate description shall be as follows:

<u>EQUIPMENT NUMBER</u>	<u>EQUIPMENT NAMEPLATE INSCRIPTION</u>
PX-530-013A-MC	PX-530-013A-MC EFFLUENT DISCHARGE SUMP PUMP MOTOR CONTROLLER
PX-530-013B-MC	PX-530-13B-MC EFFLUENT DISCHARGE SUMP PUMP MOTOR CONTROLLER
PX-530-015-MC	PX-530-015-MC EFFLUENT DISCHARGE SUMP PUMP MOTOR CONTROLLER
PX-530-016-MC	PX-530-016-MC EFFLUENT DISCHARGE SUMP PUMP MOTOR CONTROLLER

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2.1.12 Heat Tracing Materials and Devices

2.1.12.1 Electric heat tracing materials shall consist of the following:

2.1.12.1.1 Fiberglass tape used to attach the self limiting heater to the pipe, Chemelex Catalog No. GT66 or equal.

2.1.12.1.2 Stainless steel tie wire type 3021304, .051 in O.D., Chemelex Catalog No. HTTK-TW or equal.

2.1.12.1.3 Electric tracing warning signs, Chemelex Catalog No. ETL or equal.

2.1.12.1.4 Electric tracing pilot light 120 V ac, Chemelex Catalog No. AM-L with AM-BC connection kit or equal.

2.1.12.2 Cable shall be self limiting type. Construction shall consist of #16 stranded copper conductors with a core material of semi-conductive graphite network polyolefin insulation jacket and tinned copper shield.

2.1.12.3 Heat tracing cables shall meet the following criteria:

SERVICE VOLTAGE	MAX MAIN TEMP	MAX INTERMITTENT EXPOSURE	MIN WATT DENSITY	MAX FEET LENGTH	CHEMELEX OR EQUAL
120V	150°F	185°F	5W/FT @ 50°F	270	5BTV1-C
120V	150°F	185°F	8W/FT @ 50°F	200	8BTV1-C
120V	150°F	185°F	10W/FT @ 50°F	150	10BTV1-C

2.1.12.4 Electrical heating cables shall include power connection kits, Grommets, pipe straps and end termination kits, Chemelex Catalog Number AM-BC, and Am-E Type PMK or equal.

2.1.12.5 Thermostats for electric heat tracing shall be ambient sensing type. Sensor exposure limits shall be -65°F to 160°F. Sensor range shall be 15°F to 140°F and rating shall be 22 amps at 120Vac. The enclosure shall be NEMA 4X in accordance with NEMA 250 Chemelex Catalog Number AMC-1A or equal.

2.1.12.6 Contactors for heat tracing shall be 3 pole, with field replaceable contacts, mounted in a NEMA 4X enclosure and rated at 40 amps per pole at 600 volts with a 120 V ac coil. Chemlex Catalog Number E304 or equal.

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2.1.13 Grounding Materials

2.1.13.1 Grounding Conductors

2.1.13.1.1 The electrical equipment grounding and instrument ground (isolated) conductors shall be continuous XHHW insulated copper cable, sized as indicated on the Contract Drawings. Cable shall be in accordance with Paragraph 2.1.20.

2.1.13.1.2 External building ground loop and bonded connections shall be #500 kcmil bare copper wire in accordance with ASTM B3. Wire shall be Class B concentric stranded in accordance with ASTM B8.

2.1.13.1.3 Internal building ground loop and bonded connections as shown on the Contract Drawings shall be bare copper wire in accordance with ASTM B3 sized as indicated on the Contract Drawings. Wire shall be Class B concentric stranded in accordance with ASTM B8.

2.1.13.1.4 Conductors for connection to nonelectrical equipment and structures shall be sized as indicated on the Contract Drawings.

2.1.13.2 Ground Rods

Ground rods shall be copper clad steel, 5/8 inch diameter by 10 feet, as indicated on Contract Drawings. Joslyn Number J8340 and J5330 or equal.

2.1.13.3 Weld connections between ground conductors or of ground conductors to steel surfaces shall be by the exothermic process type as indicated on the Contract Drawings.

2.1.13.4 Insulating Tape

Insulating tape shall be vinyl insulating type with a continuous temperature rating of 105°C in accordance with UL 510. 3M Super 33+ Series or equal.

2.1.13.5 Ground Connections

2.1.13.5.1 Grounding connectors, screws, bolts or clamps used shall be bronze or Everdur, unless specifically indicated otherwise on the Contract Drawings, and shall be in accordance with UL 467.

2.1.13.5.2 Connectors for grounding to flat metal surfaces shall have body of cast copper alloys with bolts, nuts, and lockwashers of silicon bronze. Type as indicated on the Contract Drawings.

2.1.13.5.3 Connections to ground buses and connections of grounding conductors to switch boxes, panelboards, cabinets, etc., shall be made with either bolted mechanical lugs, compression connectors or servitposts as shown on the Contract Drawings.

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- 2.1.13.5.4 Ground connections to pipe shall be made with O.Z. Series Type ABG connectors or equal as shown on the Contract Drawings.
- 2.1.13.6 Conduit ground bushings shall be galvanized with a mechanical connection for joining a ground wire to a conduit. O.Z. Type BLG or equal.
- 2.1.13.7 Bus bar shall be high conductivity, bare copper, in accordance with ASTM B187, 1/4 inch thick by 2 inches wide.
- 2.1.14 Lightning Protection
- 2.1.14.1 A Lightning Protection system as described and detailed by NFPA-78, NEC 250-86 and the Contract Drawings shall provide positive lightning protection for fire water pump house, raw water pump house and manifold shelter.
- 2.1.14.2 The bonding required per NEC 250-86 and the NFPA-78 shall be bolted connections, air terminals, interconnecting conductors, down conductors, ground loops, grounding electrodes and other connectors or fittings required to provide an effective low-resistance path to ground.
- 2.1.14.3 Air terminal shall be 3/8" x 24" solid copper with tapered point and threaded end. Heary Catalog Number HBSOL-310C or equal.
- 2.1.14.4 Air terminal base shall be copper adhesive, with pressure type cable connection. Heary Catalog Number HB23-C or equal.
- 2.1.14.5 Cable fastener shall be adhesive type. Heary Catalog Number HB117C or equal.
- 2.1.15 Sealant
- Sealant for preventing moisture from entering conduits shall be a non-oxidizing and noncorrosive compound, Dow Corning 738 or equal.
- 2.1.16 Anti-Oxidizing Compound
- Anti-oxidizing compound for connections of grounding connectors shall be electrically conductive, rust and corrosion inhibitive, Thomas and Betts "Kopr-Shield" or equal.
- 2.1.17 Utility Chain
- Utility chain for hanging fixtures shall be end welded, zinc plated 14 gauge steel wire with 75 pound work load limit. McMasters-Carr Catalog Number 8951T16 or equal.

2.1.18 Power Factor Correction Capacitors

Power factor correction capacitors shall be 480V, wall mounted industrial type. Capacitor unit shall be 3 phase, hermetically sealed with current limiting fuses. Indoor/outdoor enclosure shall contain a pre-wired terminal block and a ground terminal. KVAR rating shall be in accordance with the Contract Drawings. Cornell Dubilier IMS Series or equal.

2.1.19 Cable Pulling Lubricant

Cable pulling lubricant shall be Buchanan Quick-Slip Catalog Number BQS-55 or equal.

2.1.20 Cable

2.1.20.1 General Requirements

2.1.20.1.1 Cable supplied shall be new, shall be the product of an established manufacturer normally engaged in the production of cable with a minimum of 5 years documented experience, and shall be that manufacturer's newest product.

2.1.20.1.2 Cable on each reel shall be continuous. Factory splices or factory repairs are not acceptable in individual conductors. Cable shall be free of abrasions and/or abnormalities.

2.1.20.2 600 Volt Power and Control Cable

The following cable codes refer to cable designations in the cable schedules, Specification Section 16111:

2.1.20.2.1 Cable Type AA, Single Conductor

- A. Cables herein specified shall have a 600 volt rating. Cables shall be Type XHHW in accordance with the National Electrical Code, NFPA 70, Article 310 and UL 44. The maximum continuous cable temperature shall be 90°C for dry and 75°C for wet location. Cable shall be color coded in accordance with Specification Section 16100.
- B. Conductor shall be uncoated, annealed, bare copper wire in accordance with ASTM B3. Conductor shall be Class B, concentric stranded in accordance with ASTM B8.
- C. The insulation shall be a flame-retardant, heat and moisture resistant type of cross-linked-polyethylene compound. The insulation shall be in accordance with Part 3 of NEMA WC7.
- D. Nominal insulation thickness and maximum wire diameter shall be as follows:

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CONDUCTOR SIZE (AWG)	INSULATION THICKNESS MILS	MAXIMUM WIRE O.D. INCHES
14	30	.14
12	30	.16
10	30	.18
8	45	.24
6	45	.28
4	45	.33
2	45	.39
1	55	.45
1/0	55	.49
2/0	55	.54
3/0	55	.59
4/0	55	.65
250	65	.72
350	65	.82
500	65	.96

2.1.20.2.2 Cable Type AB, Direct Burial

- A. Cables herein specified shall have a 600 volt rating. They shall be Type TC multiconductor cable suitable for direct burial in accordance with the National Electrical Code, NFPA 70, Articles 310 and 340, UL 1277 and UL 1581. Cables shall include an insulated ground wire. Okonite X-Olene-Okoseal Type TC cable or approved equal.
- B. Conductor shall be uncoated, annealed, bare copper wire in accordance with ASTM B3. Conductor shall be Class B, concentric stranded in accordance with ASTM B8.
- C. The conductor insulation shall be a flame-retardant, cross-linked-polyethylene compound, type XHHW, in accordance with Part 3 of NEMA WC7 and UL 44.
- D. Overall jacket shall be polyvinyl chloride (PVC) complying with UL 1277 and UL 1581. Cable jacket shall be sunlight resistant and suitable for direct burial.
- E. Nominal insulation thickness and maximum wire diameter shall be as follows:

CONDUCTOR SIZE (AWG)	NUMBER OF CONDUCTORS	INSULATION THICKNESS (MILS)	END COND SIZE (AWG)	MAXIMUM CABLE O.D. INCHES
12	3	30	12	.49
10	3	30	10	.58
8	3	45	10	.66

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CONDUCTOR SIZE (AWG)	NUMBER OF CONDUCTORS	INSULATION THICKNESS (MILS)	GND COND SIZE (AWG)	MAXIMUM CABLE O.D. INCHES
6	3	45	8	.74
4	3	45	6	.84
4	4	45	6	.97
2	3	45	6	1.01
1	3	55	6	1.14
1/0	3	55	6	1.22
2/0	3	55	4	1.32
2/0	4	55	4	1.46
4/0	3	55	4	1.55
4/0	4	55	4	1.78
250	3	65	3	1.76
350	3	65	3	1.98
500	3	65	2	2.26

2.1.20.3 Instrument Cable

The following cable types refer to cable designations in the cable schedules, Specification Section 16111:

2.1.20.3.1 Cable Type AD, 4-20 mA Signals

- A. Cable shall be a shielded single twisted pair, 600V, #16 AWG. Conductor shall be uncoated, annealed, bare copper wire in accordance with ASTM B3 and Class B, concentric stranded in accordance with ASTM B8.
- B. Primary insulation shall be 15 mils nominal 90°C rated polyvinyl chloride (PVC) and 4 mils nylon.
- C. Cable shall contain one black and one white conductor.
- D. Cable shield shall provide 100 percent coverage by aluminum-mylar laminate tape shield, helically applied over the twisted pair with the aluminum on inside in continuous contact with drain wire.
- E. Cable shall include a bare #18 AWG 7 strand tinned copper drain wire.
- F. Pair jacket shall be 45 mils nominal 90°C rated black polyvinyl chloride (PVC).
- G. Overall cable diameter shall be maximum of 0.325 inches.
- H. Cable shall be constructed in accordance with UL 13 and NEMA WC5. Dekoron 1C52-67000 or equal.

2.1.20.3.2 Cable Type AE, 120 V Signal

- A. Cable shall be type TC/THHN, 3 conductor, 600V, #14 AWG. Conductor shall be tin coated copper wire Class B, concentric stranded in accordance with ASTM B8.
- B. Primary insulation shall be 15 mils nominal 90 rated polyvinyl chloride (PVC).
- C. Cable shall contain one black, one white and one green conductor.
- D. Overall jacket shall be 45 mils nominal 90°C rated black polyvinyl chloride (PVC).
- E. Overall cable diameter shall be maximum of 0.34 inches.
- F. Cable shall be constructed in accordance with UL 13 and NEMA WC5. Anixter 2A-1403 with colors white and green or equal.

2.1.20.4 Thermocouple Cable

The following cable codes refer to cable designations in cable schedule, Specification Section 16111:

2.1.20.4.1 Thermocouple Cable Type CA

- A. Conductors shall be #16 AWG twisted solid alloy iron/constantan (Type JX) in accordance with ANSI MC96.1. Drain wire shall be #18 AWG, solid tinned copper.
- B. Primary insulation shall be 300 volt, 105°C rated Polyvinyl Chloride (PVC).
- C. Single pair cable shield shall be aluminum-mylar tape with a 25 percent minimum overlap. Drain wire shall be installed in continuous contact with aluminum shield.
- D. Overall jacket material shall be 90°C rated non propagating polyvinyl chloride (FR-PVC) in accordance with NEMA WC5. Jacket thickness shall be 35 mils.
- E. Thermocouple cable extensions wires and outer jacket shall be color coded in accordance with ANSI MC96.1.
- F. Cable shall be constructed in accordance with UL 13 and NEMA WC5. Dekoron #1802-6Jx60R or equal.

2.1.21 Transformers

2.1.21.1 General

2.1.21.1.1 The transformers specified herein shall be general-purpose, ventilated, dry-type.

2.1.21.1.2 Transformers shall comply with ANSI C57.12.70, NEMA ST20 and UL 1561.

2.1.21.1.3 Transformers shall be 480V Delta primary, 208/120V Wye Secondary, 60 Hz, 3Ø, 4W except as noted otherwise.

2.1.21.2 Transformer Enclosure

2.1.21.2.1 Transformers shall be suitable for indoor use. Space shall be provided within the transformer enclosure for making up the Seller's cable connections to the transformer winding terminals.

2.1.21.2.2 One or more openings shall be located and sized to permit ready access to the cable terminal connection lugs.

2.1.21.2.3 Enclosure grounding provisions shall consist of one grounding pad, welded on the base or on the enclosure near the base.

2.1.21.3 Transformer Taps

Full rated tap stubs shall be provided on the primary windings. Transformers shall have a minimum number of four (4) 2-1/2 percent full capacity (FC) kVA taps, (2) below nominal (BN) and (2) above nominal (AN) rated primary voltage.

2.1.21.4 Temperature Ratings

Transformer shall be designed and rated for a minimum 115°C rise above 40°C ambient.

2.1.21.5 Dry-Type Transformer with Panelboard

2.1.21.5.1 XT-32A-213 shall be a combination transformer and distribution panelboard, including transformer main and secondary circuit breakers. The transformer shall be rated 5 kVA, 480-240/120 V, single phase. Quantity and rating of circuit breakers shall be in accordance with the Contract Drawings. Square D MPZ5S40F or equal.

2.1.21.5.2 Full rated tap stubs shall be provided on the primary windings. Transformer shall have a minimum of two 5 percent full capacity below nominal primary voltage adjustment taps.

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2.1.21.6 Transformer Identification

Each transformer shall be identified by a permanently attached nameplate showing the following:

- A. The identification "Transformer"
- B. Number of phases
- C. Frequency
- D. kVA rating
- E. Voltage rating
- F. Temperature rise
- G. Name of Manufacturer
- H. Vector diagram
- I. Tap voltages
- J. Percent impedance
- K. Connection diagram
- L. Approximate total weight

2.1.21.7 Each transformer shall be identified by a laminated phenolic nameplate attached with screws showing the equipment number and description as shown on Attachment A. Nameplates shall have 3/4 inch high etched black lettering on white background.

2.1.22 Panelboards

2.1.22.1 General

Panelboards specified herein shall be factory assembled safety dead front type in accordance with NEMA PB1 and UL67.

2.1.22.2 Enclosures

2.1.22.2.1 The panelboard assembly shall be enclosed in a surface mounted NEMA 1 steel cabinet per NEMA 250. Cabinets shall have wiring gutter on bottom, sides and top, without knockouts, with safety dead front and all line parts concealed. Square D type NQOD, 208/120 V ac, and Square D type NEHB, 480/277 V ac or equal.

- 2.1.22.2.2 Fronts shall include doors and have flush tumbler-type locks. Locks shall be keyed alike. Each panelboard shall be supplied with a key.
- 2.1.22.2.3 Fronts shall have adjustable indicating trim clamps which shall be completely concealed when the doors are closed. Fronts shall not be removable with door in the locked position.
- 2.1.22.2.4 A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door.
- 2.1.22.2.5 Each panelboard shall have a ground bus bolted to the frame and an insulated neutral bus. Ground and neutral buses shall have industry standard wire terminals for all incoming and branch circuit conductors.
- 2.1.22.3 Circuit Breaker
- 2.1.22.3.1 Circuit breakers shall have 100 ampere minimum frame size complete with thermal magnetic non-interchangeable trip elements. Multi-pole breakers shall have common trip action. Breakers shall be bolt-on, quick-make, quick-break, trip indicating type with solderless lugs in accordance with NEMA AB1 and UL 489. Number of poles and trip rating for each circuit breaker shall be as defined on the Contract Drawing panelboard schedules.
- 2.1.22.3.2 Circuit breakers shall be rated no less than: 10,000 amperes rms interrupting for 208Y/120 V and 14000 amperes rms for 480Y/277 V.
- 2.1.22.3.3 Main circuit breakers 225 amperes and larger shall be mounted vertically.
- 2.1.22.3.4 The number of future circuit breaker spaces shall be as defined on the Contract Drawings.
- 2.1.22.4 Busing Assembly
- 2.1.22.4.1 Panelboard bus structure including main breaker or main lugs shall have current ratings as shown on the Contract Drawings.
- 2.1.22.4.2 The buses in all panels shall be of 98 percent conductivity copper. Neutral buses shall be of same capacity as main buses in each panel. Compression type copper lugs shall be provided on each panelboard bus. Lugs shall be arranged for top or bottom entry for panel feeders.

2.1.22.5 Identification

An engraved nameplate of laminated phenolic with 3/4 inch high etched black lettering on a white background shall be attached with screws, centered on the top trim of each panelboard and bear the equipment name and number as shown on Attachment B.

2.1.23 Fused Disconnect Switch

2.1.23.1 Fused disconnect switch shall be rated 600 V, 30 amps, 3 phase, 4 wire with 15 amps fuse as shown on the Contract Drawings. Disconnect switch shall be factory assembled in a NEMA 3R enclosure. Square D type H361NRB or equal.

2.1.23.2 An engraved nameplate of laminated phenolic with 3/4 inch high etched black lettering on a white background shall be attached with screws.

EQUIPMENT
NUMBER

UH-05AA-005

EQUIPMENT NAMEPLATE
INSCRIPTION

UH-05AA-005
HEATER DISCONNECT
SWITCH

2.1.24 Interior Lighting

2.1.24.1 Lamps

Fluorescent lamps shall be cool white type. Incandescent and low pressure sodium lamps shall be clear type.

2.1.24.2 Fixtures

2.1.24.2.1 Fluorescent Lighting Fixtures

Fluorescent fixture shall be equipped with ballasts that shall be UL listed, high power factor type. The ballast shall be rated for start-up in operating environment specified in Paragraph 1.5.2. Rapid start ballasts shall be in accordance with ANSI C82.2. Fixtures shall be suitable for through wiring in accordance with the National Electrical Code, Article 410-11 and 410-31.

A. Fixture # L5

Fixture shall be industrial type, open ventilated reflector, 4'-0", two lamps, 277 V, rapid start, energy saving ballast, chain mounted. Prudential Lighting Catalog Number P-202-48RS-SR10-277V or equal.

B. Fixture # L7

Fixture shall be industrial type, open ventilated reflector, 4'-0", two lamps, 120 V, rapid start, energy saving ballast, chain mounted. Prudential Lighting Catalog Number P-202-48RS-SR10-120V or equal.

2.1.24.2.2 Exit and Emergency Lighting Fixtures

A. Fixture # L30

Fixture shall be self-contained 120/277 V, with two lampheads, par 36, 25 W lamps, surface mounted, seismic qualified, constructed of 18 gauge steel. Battery shall be 90 minute minimum, sealed, rechargeable type. Holophane Catalog Number M-19-2H-SEIS-PT or equal.

B. Fixture # L41

Fixture shall be self-contained battery pack type exit sign, UL listed with universal mounting. Housing shall be die-formed, cast aluminum door and ends with white letters and arrows on green background. Fixture shall include 120/277 volt, nickel-cadmium batteries for 90 minutes of illumination. Lithonia Catalog Number APIWG-02-AE-IN or equal.

2.1.25 Outdoor Lighting

2.1.25.1 Low Pressure Sodium Fixtures

Low pressure sodium lighting fixtures shall be in accordance with ANSI C78.41. Ballasts shall be high power factor type in accordance with ANSI C82.9.

A. Fixture # L20

Fixture shall be wall pack type, 277 V, 35 W lamp with integral ballast and photocell receptacle in luminaire housing. Luminaire housing shall be a cast aluminum for outdoor installation. Lens shall be polycarbonate high impact plastic and gasketed. Voigt Lighting Industries, Inc. Catalog Number 0-36-277PI or equal.

B. Fixture # L45

Fixture shall be 120 V, wall pack type, 35 W with integral ballast and photocell receptacle in luminaire housing. Luminaire housing shall be cast aluminum suitable for outdoor installation with controlling photo cell. Lens shall be

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polycarbonate high impact plastic and gasketed. Voigt
Lighting Industries Catalog Number 0-36-120PI or equal.

2.1.26 Marking Tape

Plastic marking tape for identifying underground electrical cable shall be six inches wide, yellow color, without printing. Reef Industries Terra Tape or equal.

2.1.27 Wood Boards

Boards for protecting underground direct buried cable(s) shall be preservative treated, one inch thick by eight inches wide (nominal).

2.1.28 Precast Manholes

2.1.28.1 Precast manholes shall be manufactured from reinforced concrete and be produced in a plant specifically designed for that purpose. All work shall be performed under strict plant controlled procedures and supervision.

2.1.28.2 Manhole sizes and knockout details shall be as shown on the Contract Drawings.

2.1.28.3 Precast concrete shall meet the provision of ACI 318, Chapter 16.

2.1.28.4 Manholes shall be designed to resist the following loads in accordance with ACI 318:

- A. Dead loads due to self weight and any soil overburden loads. The weight of the compacted soil shall be taken to be 110 pcf.
- B. Live loads due to an HS20-44 truck load as defined in AASHTO HB-14 acting directly over or adjacent to each manhole.
- C. Lateral earth pressure based on an at-rest lateral earth pressure coefficient of 0.43. To account for increased lateral pressure due to residual compaction effects the lateral earth pressure shall not be taken to be less than 500 psf at any location less than 11 feet beneath the finished surface. The applied lateral earth pressure shall be increased by the application of an additional surcharge to take into account the effect of traffic loads.
- D. Impact loads due to traffic loads.
- E. Erection and transportation loads.

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- 2.1.28.5 Precast manholes shall be manufactured from normal weight concrete in accordance with the following:
- A. Cement conforming to ASTM C150 Type I or II.
 - B. Aggregates conforming to ASTM C33. Gradation as determined by the manufacturer to meet design requirements.
 - C. Admixtures as determined by the manufacturer to meet design requirements.
 - D. Reinforcing steel conforming to ASTM A615 Grade 60 or ASTM A706 Grade 60.
 - E. Concrete mix as determined by the manufacturer to meet the design requirements but shall not have a 28 day compression strength less than 4000 psi.
- 2.1.28.6 Each component of a precast manhole shall be provided a unique identifier (mark number), in accordance with Paragraph 16.5 of ACI 318.
- 2.1.28.7 Manhole covers shall be round cast iron heavy-traffic type not less than 30 inches in diameter. Covers shall be identified by cast-in lettering "ELECTRICAL."
- 2.1.28.8 Plastic joint sealing compound shall be provided to seal joint between manhole sections.
- 2.1.28.9 Manholes shall be provided with 12 inch diameter drain sump, pulling irons and cast in slotted channels for cable supports as shown on the Contract Drawings.
- 2.1.28.10 Two knockouts for ground rods shall be provided at opposing ends of the manhole.
- 2.1.28.11 Manholes shall be provided with an adequate size ladder.
- 2.1.28.12 Manholes shall be Utility Vault Company Type "LA" or equal.
- 2.1.29 Precast Pull Boxes
- 2.1.29.1 Precast pull boxes shall be manufactured from reinforced concrete and be produced in a plant specifically designed for that purpose. All work shall be performed under strict plant controlled procedures and supervision.
- 2.1.29.2 Pull boxes sizes and knockout details shall be as shown on the Contract Drawings.
- 2.1.29.3 Precast concrete shall meet the provision of ACI 318, Chapter 16.

- 2.1.29.4 Pull boxes shall be designed to resist the following loads in accordance with ACI 318:
- A. Dead loads due to self weight and any soil overburden loads. The weight of the compacted soil shall be taken to be 110 pcf.
 - B. Live loads due to an HS20-44 truck load as defined in AASHTO HB-14 acting directly over or adjacent to each pull box.
 - C. Lateral earth pressure based on an at-rest lateral earth pressure coefficient of 0.43. To account for increased lateral pressure due to residual compaction effects the lateral earth pressure shall not be taken to be less than 500 psf at any location less than 11 feet beneath the finished surface. The applied lateral earth pressure shall be increased by the application of an additional surcharge to take into account the effect of traffic loads.
 - D. Impact loads due to traffic loads.
 - E. Erection and transportation loads.
- 2.1.29.5 Precast pull boxes shall be manufactured from normal weight concrete in accordance with the following:
- A. Cement conforming to ASTM C150 Type I and II.
 - B. Aggregates conforming to ASTM C33. Gradation as determined by the manufacturer to meet design requirements.
 - C. Admixtures as determined by the manufacturer to meet design requirements.
 - D. Reinforcing steel conforming to ASTM A615 Grade 60 or ASTM A706 Grade 60.
 - E. Concrete mix as determined by the manufacturer to meet the design requirements but shall not have a 28 day compression strength less than 4000 psi.
- 2.1.29.6 Each component of a precast pull box shall be provided a unique identifier (mark number), in accordance with Paragraph 16.5 of ACI 318.
- 2.1.29.7 Plastic joint sealing compound shall be provided as recommended by the pull box manufacturer.
- 2.1.29.8 Pull boxes shall be Utility Vault Company Type "LA" or equal.

2.1.29.9 Pull boxes shall be provided with 12 inch diameter drain sump, pulling irons and 1/2 inch diameter inserts for cable supports, 4 each wall.

2.1.29.10 Two knockouts for ground rods shall be provided at opposing ends of the pull boxes.

2.1.30 Underground Cable Markers

Route markers shall be galvanized steel with a 3 inch steel helix welded to a 7/16 inch diameter rod. Attached to the rod shall be a 2 inch by 3/4 inch by 30 inch 10 gauge steel stake with a 4 inch by 7 inch steel identification plate mounted near the top. The designation "Cable" with a directional arrow shall be marked on face plate. AB Chance Catalog No. C554-0183.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Cable

2.2.1.1 Surface Marking

The surface of the insulation shall have a durable marking, at intervals not exceeding 24 inches, which shall consist of: manufacturer's name, trademark, or other distinctive marking which identifies the organization responsible for the product; the type letters (TC or XHHW); the wire size in AWG; maximum voltage; and UL marking.

2.2.1.2 Labeling

Each reel shall have a weatherproof metal or plastic tag firmly attached indicating manufacturer, conductor size, length, manufacturer's type, temperature rating, voltage class, and Seller's purchase order and item numbers.

2.2.2 Transformers

The complete transformer shall be subjected to a Factory Acceptance Test in accordance with ANSI C57.12.50. As a minimum an operational check of each component and a demonstration of overall performance shall be performed as described below:

- A. Ratio test on the rated voltage connections and on all tap connections.
- B. Phase-relation and polarity test on the rated voltage connections.
- C. Applied potential and induced potential tests.

PART 3 EXECUTION

3.1 INSTALLATION, APPLICATION AND ERECTION

Materials and devices specified herein shall be installed in accordance with Specification Section 16100, Electrical Installation.

3.2 FIELD QUALITY CONTROL

Materials and devices specified herein shall be inspected and tested in accordance with Specification Section 16905, Electrical Testing.

END OF SECTION

9443202-1884

ATTACHMENT A
DRY-TYPE TRANSFORMERS


<u>EQUIPMENT NUMBER</u>	<u>EQUIPMENT NAMEPLATE INSCRIPTION</u>	<u>kVA RATING</u>	<u>TEMPERATURE RISE (°C)</u>	<u>MAXIMUM OVERALL DIMENSIONS H x W x D (Inches)</u>
XT-32A-801	XT-32A-801 480VΔ-208Y/120V Distribution Transformer	15	115°	23 x 21.5 x 15
XT-32A-802	XT-32A-802 480VΔ-208Y/120V Distribution Transformer	15	115°	22.5 x 21.5 x 12.5
XT-32A-213	XT-32A-213 480V-240/120V Transformer/Panel "A" Power Center	5	115°	32.75 x 12.75 x 12

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ATTACHMENT B
ELECTRICAL PANELBOARDS

<u>EQUIPMENT NUMBER</u>	<u>VOLTAGE AND PHASE</u>	<u>PANEL NAMEPLATE INSCRIPTION</u>	<u>MAXIMUM OVERALL PANEL DIM. (INCHES) (H x W x D)</u>
DA-32A-801	480Y/277V 3Ø, 4W	DA-32A-801 480/277V 3Ø, 4W Distribution Panel "A"	55.5 x 20 x 6
DA-32A-802	480Y/277V 3Ø, 4W	DA-32A-802 480/277V 3Ø, 4W Distribution Panel "A"	55.5 x 20 x 6
DA-32A-851	208Y/120V 3Ø, 4W	DA-32B-851 208/120V 3Ø, 4W Power Panel "A"	32 x 20 x 6
DA-32A-852	208Y/120V 3Ø, 4W	DA-32A-852 208/120V 3Ø, 4W Heat Tracing Panel "C"	32 x 20 x 6
DA-32A-853	208Y/120V 3Ø, 4W	DA-32A-853 208/120V 3Ø, 4W Distribution Panel "A"	32 x 20 x 6

APR - 1 1993

3	4/1/93	REVISIONS PER CR-HWVP-690, 760, 917 AND 960.	JLD	SS	JLD	MS
2	3/12/93	REVISION PER CR-HWVP-0847 AND MINOR CHANGES	BRE	LMB	SAR	PJS
1	8/21/92	REVISION PER CR-HWVP-656 AND OTHER MINOR CHANGES	MHF	MJH	JGK	NHW
0	12/19/91	APPROVED FOR CONSTRUCTION	JLD	PvK	JLD	GK
			EJ	AKY	BER	RSP
			PvK	JLD	PvK	GK
			EJ	MJH	JGK	RNG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117149A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-B6RL10838				
REV. _____ DATE _____ ERO. _____						
SIGNATURE		DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION			
PROJ. DIR. R N GIBBONS		12-19-91				
Q.A. ENGR. J G KELLY		12-19-91				
INDEPENDENT SAFETY M J HIGUERA		12-17-91				
PROJECT PKG ENGINEER E R JACOBS		12-17-91				
ENGINEERING MGR. G N KIMURA		12-17-91				
SUPERVISOR J L DATTE		12-16-91				
DESIGN ENGINEER P v KRONBURG		12-16-91	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT			
CHECKED J L DATTE		12-16-91	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
DRAWN H MELGARES		7-5-91	SCALE NONE	BLDG. NO.	INDEX NO.	
CLASSIFICATION NONE	BY NOT REQ'D	DRAWING NUMBER H-2-117149		SHEET 1	OF 1	REV. 3

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DISTRIBUTION CODE: 301

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DATE: 03-29-93

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APR - 1 1993

3	4/1/93	REVISIONS PER CR-HWVP-690, 760,	JLD	CS	JLD	CS
		917 AND 960	EJ	MA	PK	PK
2	3/12/93	REVISIONS PER CR-HWVP-847	BRE	LMB	SAR	PJS
			MHF	MJH	JGK	NHW
1	8/21/92	REVISION PER CR-HWVP-656 AND	JLD	PvK	JLD	GK
		OTHER MINOR CHANGES	EJ	AKY	BER	RSP
0	12/19/91	APPROVED FOR CONSTRUCTION	PvK	JLD	PvK	GK
			EJ	MJH	JGK	RNG

REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS
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CADFILE	B117150A	CADCODE	2B:IBM:ACD2:10.C2:SS
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ENGINEERING RELEASE REV. _____ DATE _____ ERO. _____	U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838
--	--

SIGNATURE	DATE
PROJ. DIR. R N GIBBONS	12/19/91
O.A. ENGR. J G KELLY	12/19/91



FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

INDEPENDENT SAFETY M J HIGUERA	12/19/91
PROJECT PKG ENGINEER E R JACOBS	12/17/91
ENGINEERING MGR. G N KIMURA	12/17/91
SUPERVISOR J L DATTE	12/16/91

MECHANICAL SITE UTILITIES DRAWING INDEX

DESIGN ENGINEER P v KRONBURG	12/16/91	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT
CHECKED J L DATTE	12/16/91	PROJECT B-595
DRAWN H. MELGARES	7/5/91	FLUOR CONTRACT NO. 8457
CLASSIFICATION NONE	BY NOT REQ'D	CWBS NO. A160
		SCALE NONE
		BLDG. NO.
		INDEX NO.
		DRAWING NUMBER H-2-117150
		SHEET 1
		OF 1
		REV. 3

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APR - 1 1993

3	4/1/93	REVISION PER CR-HWVP-0760	JLD	PvK	JLD	GK
2	3/12/93	REVISIONS PER CR-HWVP-0847 AND MINOR CHANGES	EJ	AKY	BER	RSP
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR	BRE	SAR	JS/GK
0	12/19/91	APPROVED FOR CONSTRUCTION	ML	SR	RPK	BD
			GK	MH	JK	RG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			

CADFILE B117151A

CADCODE 2B:IBM:ACD2:10.C2:SS

ENGINEERING RELEASE

REV. _____ DATE _____

ERO. _____

U.S. DEPARTMENT OF ENERGY

Richland Operations Office

DE - AC06-86RL10838

SIGNATURE

DATE

PROJ. DIR.
R. GIBBONS

12-19-91

D.A. ENGR.
J. KELLY

12-19-91

INDEPENDENT SAFETY
M. HIGUERA

12-19-91

PROJECT PKG ENGINEER
B. DENNIS

12-18-91

ENGINEERING MGR.
G. KIMURA

12-17-91

SUPERVISOR
R. KUMAR

12-17-91

DESIGN ENGINEER
M. LIGHTLE

12-17-91

CHECKED
S. RUNK

12-16-91

DRAWN
F. TEVES

12-16-91

CLASSIFICATION

BY

DRAWING NUMBER

SHEET

OF

REV.

NONE

NOT REQ'D

H-2-117151

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FLUOR DANIEL, INC.

ADVANCED TECHNOLOGY DIVISION

CIVIL
UNDERGROUND UTILITY
INFORMATION SHEET

PROJECT TITLE

HANFORD WASTE VITRIFICATION PLANT

PROJECT

B-595

FLUOR CONTRACT NO.

8457

CWBS NO.

A160

SCALE

NONE

BLDG. NO.

INDEX NO.

DISTRIBUTION CODE: 053

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DATE: 3/29/93

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QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

3	4/1/93	REVISION PER CR-HWVP-0760	JAN	DRM	BRE	
2	3/12/93	REVISED KEY MAP PER CR-HWVP-0847	BRE	LMB	SAR	PJS
			MHF	MJH	JGK	NHW
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR	BRE	SAR	JS / GK
			EJ	AKY	BER	RSP
0	12/19/91	APPROVED FOR CONSTRUCTION	ML	SR	RPK	BD
			GK	MH	JK	RG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			

CADFILE B117152A

CADCODE 2B:IBM:ACD2:10.C2:SS

ENGINEERING RELEASE

REV. _____ DATE _____
ERO. _____

SIGNATURE	DATE
PROJ. DIR. R. GIBBONS	12-19-91
O.A. ENGR. J. KELLY	12-19-91
INDEPENDENT SAFETY M. HIGUERA	12-19-91
PROJECT PKG ENGINEER B. DENNIS	12-18-91
ENGINEERING MGR. G. KIMURA	12-17-91
SUPERVISOR R. KUMAR	12-17-91

U.S. DEPARTMENT OF ENERGY

Richland Operations Office
DE - AC06-86RL10838



FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

CIVIL UNDERGROUND UTILITY PLAN

DESIGN ENGINEER M. LIGHTLE	12-17-91
CHECKED S. RUNK	12-16-91
DRAWN F. TEVES	1-14-92

PROJECT TITLE
HANFORD WASTE VITRIFICATION PLANT

PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160
SCALE 1"=40'	BLDG. NO.	INDEX NO.

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV.
NONE	NOT REQ'D	H-2-117152	1	1	3

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QUALITY LEVEL II
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APR - 1 1993

3	4/1/93	REVISION PER CR-HWVP-0760	DRM	BRE		
2	3/12/93	REVISED KEY MAP PER CR-HWVP-0847 AND DRAINFIELD COORDINATES	BRE MHF	LMB MJH	SAR JGK	PJS NHW
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR EJ	BRE AKY	SAR BER	JS RSP
0	12/19/91	APPROVED FOR CONSTRUCTION	ML GK	SR MH	RPK JK	BD RG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117153A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S.DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838				
REV. _____ DATE _____ ERO. _____						
SIGNATURE		DATE	FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION CIVIL UNDERGROUND UTILITY PLAN			
PROJ. DIR. R. GIBBONS		12-19-91				
O.A. ENGR. J. KELLY		12-19-91				
INDEPENDENT SAFETY M. HIGUERA		12-19-91				
PROJECT PKG ENGINEER B. DENNIS		12-18-91				
ENGINEERING MGR. G. KIMURA		12-17-91				
SUPERVISOR R. KUMAR		12-17-91				
DESIGN ENGINEER M. LIGHTLE		12-17-91				
CHECKED S. RUNK		12-16-91	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT			
DRAWN F. TEVES		12-4-90	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
CLASSIFICATION		BY	SCALE 1"=40'	BLDG. NO.	INDEX NO.	
NONE		NOT REQ'D	DRAWING NUMBER H-2-117153		SHEET 1	OF 1
					REV. 3	

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DATE: 3/29/93

QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

REFERENCE	REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
17096	3	4/1/93	REVISION PER CR-HWVP-0760	DRM	BRE		
17095	2	3/12/93	REVISED KEY MAP PER CR-HWVP-0847	BRE	LMB	SAR	PJS
17095				MHF	MJH	JGK	NHW
17096	1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR	BRE	SAR	JS/GK
17095	0	12/19/91	APPROVED FOR CONSTRUCTION	ML	SR	RPK	BD
				GK	MH	JK	RG

CADFILE	B117154A	CADCODE	2B:IBM:ACD2:10.C2:SS			
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838				
REV. _____	DATE _____					
ERO. _____		 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION				
SIGNATURE	DATE					
PROJ. DIR. R. GIBBONS	12-19-91	CIVIL UNDERGROUND UTILITY PLAN				
O.A. ENGR. J. KELLY	12-19-91					
INDEPENDENT SAFETY M. HIGUERA	12-19-91					
PROJECT PKG ENGINEER B. DENNIS	12-18-91					
ENGINEERING MGR. G. KIMURA	12-17-91					
SUPERVISOR R. KUMAR	12-17-91					
DESIGN ENGINEER M. LIGHTLE	12-17-91	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT				
CHECKED S. RUNK	12-16-91	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160		
DRAWN F. TEVES	12-1-91	SCALE 1" = 40'	BLDG. NO.	INDEX NO.		
CLASSIFICATION NONE	BY NOT REQ'D	DRAWING NUMBER H-2-117154		SHEET 1	OF 1	REV. 3


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QUALITY LEVEL II
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APR - 1 1993

REFERENCE	3	4/1/93	REVISION PER CR-HWVP-0760	444	OPW	ARE	
	2	3/12/93	REVISED KEY MAP PER CR-HWVP-0847	BRE	LMB	SAR	PJS
				MHF	MJH	JGK	NHW
	1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR	BRE	SAR	JS/GK
	0	12/19/91	APPROVED FOR CONSTRUCTION	ML	SR	RPK	BD
				GK	MH	JK	RG
	REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
	CADFILE	B117155A		CADCODE	2B:IBM:ACD2:10.C2:SS		
	ENGINEERING RELEASE			U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838			
	REV. _____ DATE _____						
	ERO. _____			 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION			
	SIGNATURE	DATE					
	PROJ. DIR.	12-19-91		CIVIL UNDERGROUND UTILITY PLAN			
	R. GIBBONS						
	O.A. ENGR.	12-19-91					
	J. KELLY						
	INDEPENDENT SAFETY	12-19-91					
	M. HIGUERA						
	PROJECT PKG ENGINEER	12-18-91					
	B. DENNIS			HANFORD WASTE VITRIFICATION PLANT			
	ENGINEERING MGR.	12-17-91					
	G. KIMURA						
	SUPERVISOR	12-17-91					
	R. KUMAR						
	DESIGN ENGINEER	12-17-91		PROJECT TITLE			
	M. LIGHTLE						
	CHECKED	12-16-91		PROJECT	FLUOR CONTRACT NO.	CWBS NO.	
	S. RUNK			B-595	8457	A160	
	DRAWN	12-4-90		SCALE	BLDG. NO.	INDEX NO.	
	D. SCHMER			1" = 40'			
	CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV.	
	NONE	NOT REQ'D	H-2-117155	1	1	3	


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APR - 1 1993

3	4/1/93	REVISION PER CR-HWVP-0760	484	DRM	PRE	
2	3/12/93	REVISIONS PER CR-HWVP-0847	BRE	LMB	SAR	PJS
			MHF	MJH	JGK	NHW
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR	BRE	SAR	JS / GK
			EJ	AKY	BER	RSP
0	12/19/91	APPROVED FOR CONSTRUCTION	ML	SR	RPK	BD
			GK	MH	JK	RG

REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS	
CADFILE	B117156A		CADCODE	
ENGINEERING RELEASE		2B:IBM:ACD2:10.C2:SS		
REV. _____ DATE _____		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838		
ERO. _____				
SIGNATURE	DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION		
PROJ. DIR. R. GIBBONS	12-19-91			
O.A. ENGR. J. KELLY	12-19-91			
INDEPENDENT SAFETY M. HIGUERA	12-19-91			
PROJECT PKG ENGINEER B. DENNIS	12-18-91			
ENGINEERING MGR. G. KIMURA	12-17-91			
SUPERVISOR R. KUMAR	12-17-91	CIVIL UNDERGROUND UTILITY PLAN		
DESIGN ENGINEER M. LIGHTLE	12-17-91			
CHECKED S. RUNK	12-16-91			
DRAWN F. TEVES	12/15/92	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160
CLASSIFICATION NONE	BY NOT REQ'D	SCALE 1" = 40'	BLDG. NO.	INDEX NO.
DRAWING NUMBER H-2-117156		SHEET 1	OF 1	REV. 3

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QUALITY LEVEL II SAFETY CLASS 3


APR - 1 1993

3	4/1/93	REVISION PER CR-HWVP-0760	<i>RL</i>	<i>DRM</i>	<i>BRE</i>	
2	3/12/93	REVISED KEY MAP PER CR-HWVP-0847	BRE	LMB	SAR	PJS
			MHF	MJH	JGK	NHW
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR	BRE	SAR	<i>JS</i> <i>GK</i>
			EJ	AKY	BER	RSP
0	12/19/91	APPROVED FOR CONSTRUCTION	ML	SR	RPK	BD
			GK	MH	JK	RG

REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS		
CADFILE	B117158A	CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S.DEPARTMENT OF ENERGY			
REV. _____ DATE _____		Richland Operations Office			
ERO. _____		DE - AC06-86RL10838			
SIGNATURE	DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION CIVIL UNDERGROUND UTILITY PLAN			
PROJ. DIR. R. GIBBONS	12-19-91				
Q.A. ENGR. J. KELLY	12-19-91				
INDEPENDENT SAFETY M. HIGUERA	12-19-91				
PROJECT PKG ENGINEER B. DENNIS	12-18-91				
ENGINEERING MGR. G. KIMURA	12-17-91				
SUPERVISOR R. KUMAR	12-17-91				
DESIGN ENGINEER M. LIGHTLE	12-17-91				
CHECKED S. RUNK	12-16-91	PROJECT TITLE HANFORD WASTE VTRIFICATION PLANT			
DRAWN F.TEVES	12-5-91	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
CLASSIFICATION		SCALE 1"=40'	BLDG. NO.	INDEX NO.	
BY		DRAWING NUMBER H-2-117158	SHEET 1	OF 1	REV. 3
NONE		NOT REQ'D			

QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

3	4/1/93	REVISION PER CR-HWVP-0760 AND 0917	JGH	DRM	PRE	
2	3/12/93	REVISED KEY MAP PER CR-HWVP- 0847	BRE	LMB	SAR	PJS
			MHF	MJH	JGK	NHW
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR	BRE	SAR	JS / GK
			EJ	AKY	BER	RSP
0	12/19/91	APPROVED FOR CONSTRUCTION	ML	SR	RPK	BD
			GK	MH	JK	RG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117159A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838				
REV. _____ DATE _____ ERO. _____						
SIGNATURE		DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION			
PROJ. DIR. R. GIBBONS		12-19-91				
O.A. ENGR. J. KELLY		12-19-91				
INDEPENDENT SAFETY M. HIGUERA		12-19-91				
PROJECT PKG ENGINEER B. DENNIS		12-18-91				
ENGINEERING MGR. G. KIMURA		12-17-91				
SUPERVISOR R. KUMAR		12-17-91	CIVIL UNDERGROUND UTILITY PLAN			
DESIGN ENGINEER M. LIGHTLE		12-17-91				
CHECKED S. RUNK		12-16-91	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT			
DRAWN F. TEVES		12-5-91	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
			SCALE SHOWN	BLDG. NO.	INDEX NO.	
CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV.	
NONE	NOT REQ'D	H-2-117159	1	1	3	

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INITIALS: DRM
DATE: 3/29/93

QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

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3	4/1/93	REVISION PER CR-HWVP-0760 AND 0917		DRM	BRE	
2	3/12/93	REVISION PER CR-HWVP-0847	BRE	LMB	SAR	PJS
			MHF	MJH	JGK	NHW
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR	BRE	SAR	JS / GK
			EJ	AKY	BER	RSP
0	12/19/91	APPROVED FOR CONSTRUCTION	ML	SR	RPK	BD
			GK	MH	JK	RG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117160A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838				
REV. _____ DATE _____ ERO. _____						
SIGNATURE		DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION CIVIL UNDERGROUND UTILITY PLAN			
PROJ. DIR. R. GIBBONS		12-19-91				
O.A. ENGR. J. KELLY		12-19-91				
INDEPENDENT SAFETY M. HIGUERA		12-19-91				
PROJECT PKG ENGINEER B. DENNIS		12-18-91				
ENGINEERING MGR. G. KIMURA		12-17-91				
SUPERVISOR R. KUMAR		12-17-91				
DESIGN ENGINEER M. LIGHTLE		12-17-91	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT			
CHECKED S. RUNK		12-16-91	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
DRAWN F. TEVES		1/11/93	SCALE SHOWN	BLDG. NO.	INDEX NO.	
CLASSIFICATION		BY	DRAWING NUMBER		SHEET	OF
NONE		NOT REQ'D	H-2-117160		1	1
						REV. 3

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DISTRIBUTION CODE: 053

C10

ACAD

INITIALS: DRM

DATE: 3/29/93


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117164

QUALITY LEVEL II
SAFETY CLASS 3

APR - 1 1993

1	4/1/93	REVISED PER CR-HWVP-0760 AND 0917	PRE	DRM	PRE	
0	8/21/92	ADDED PER CR-HWVP-656 APPROVED FOR CONSTRUCTION	SAR	BRE	SAR	JS GK
			EJ	AKY	BER	RSP
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			

CADFILE	B117161A	CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE REV. _____ DATE _____ ERO. _____		U.S.DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838			
SIGNATURE	DATE				
PROJ. DIR. R. POULTER	8-20-92	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION			
O.A. ENGR. B. RITBERG	8-20-92				
INDEPENDENT SAFETY A. YEE	8-20-92				
PROJECT PKG ENGINEER E. JACOBS	8-20-92				
ENGINEERING MGR. G. KIMURA	8-20-92				
SUPERVISOR S. RUNK	8-20-92	CIVIL UNDERGROUND UTILITIES SECTIONS & DETAILS			
DESIGN ENGINEER B. EISENBISE	8-20-92				
CHECKED S. RUNK	8-20-92	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
DRAWN F.TEVES	4-15-92	SCALE SHOWN	BLDG. NO.	INDEX NO.	
CLASSIFICATION NONE	BY NOT REQ'D	DRAWING NUMBER H-2-117161	SHEET 1	OF 1	REV. 1

DISTRIBUTION CODE:

C11

ACAD

INITIALS: DRM
DATE: 3/29/93

QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

1	4/1/93	REVISION PER CR-HWVP-0760 AND 0917	BRE	DRM	BRE	
0	8/21/92	ADDED PER CR-HWVP-656 APPROVED FOR CONSTRUCTION	SAR	BRE	SAR	JS GK
			EJ	AKY	BER	RSP
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			

CADFILE	B117162A	CADCODE	2B:IBM:ACD2:10.C2:SS
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ENGINEERING RELEASE

REV. _____ DATE _____
ERO. _____

SIGNATURE	DATE
PROJ. DIR. R. POULTER	8-20-92
D.A. ENGR. B. RITTBERG	8-20-92
INDEPENDENT SAFETY A. YEE	8-20-92
PROJECT PKG ENGINEER E. JACOBS	8-20-92
ENGINEERING MGR. G. KIMURA	8-20-92
SUPERVISOR S. RUNK	8-20-92
DESIGN ENGINEER B. EISENBISE	8-20-92
CHECKED S. RUNK	8-20-92
DRAWN F. TEVES	4-15-92

U.S. DEPARTMENT OF ENERGY

Richland Operations Office
DE - AC06-B6RL10838



FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISION

CIVIL UNDERGROUND UTILITIES SECTIONS & DETAILS

PROJECT TITLE

HANFORD WASTE VITRIFICATION PLANT

PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160
SCALE SHOWN	BLDG. NO.	INDEX NO.

CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV.
NONE	NOT REQ'D	H-2-117162	1	1	1

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DISTRIBUTION CODE: 053

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INITIALS: DRM

DATE: 3/29/93


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QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

2	4/1/93	REVISION PER CR-HWVP-0760	181	DRM	BRE	
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR EJ	BRE AKY	SAR BER	JS RSP
0	12/19/91	APPROVED FOR CONSTRUCTION	ML GK	SR MH	RPK JK	BD RG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117164A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Operations Office</p> <p>DE - AC06-86RL10838</p>				
REV. _____ DATE _____						
ERO. _____		<p> FLUOR DANIEL, INC.</p> <p>ADVANCED TECHNOLOGY DIVISION</p>				
SIGNATURE						
DATE		<p>CIVIL</p> <p>UNDERGROUND UTILITIES</p> <p>SECTIONS & DETAILS</p>				
PROJ. DIR.						
R. GIBBONS						
O.A. ENGR.						
J. KELLY						
12-19-91						
INDEPENDENT SAFETY		<p>PROJECT TITLE</p> <p>HANFORD WASTE VITRIFICATION PLANT</p>				
M. HIGUERA						
12-19-91						
PROJECT PKG ENGINEER						
B. DENNIS						
12-18-91						
ENGINEERING MGR.		<p>PROJECT B-595</p> <p>FLUOR CONTRACT NO. 8457</p> <p>CWBS NO. A160</p>				
G. KIMURA						
12-17-91						
SUPERVISOR						
R. KUMAR						
12-17-91						
DESIGN ENGINEER		<p>SCALE</p> <p>SHOWN</p> <p>BLDG. NO.</p> <p>INDEX NO.</p>				
M. LIGHTLE						
12-17-91						
CHECKED						
S. RUNK						
12-16-91						
DRAWN		<p>DRAWING NUMBER</p> <p>H-2-117164</p> <p>SHEET 1</p> <p>OF 1</p> <p>REV. 2</p>				
F. TEVES						
6-9-92						
CLASSIFICATION						
NONE						
BY NOT REQ'D						

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DISTRIBUTION CODE: 053

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ACAD

INITIALS: DRM

DATE: 3/29/93

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QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

3	4/1/93	REVISION PER CR-HWVP-0760	<i>DRM</i>	<i>PRE</i>		
2	3/12/93	REROUTED DRX-4"-530-132R PER CR-HWVP-0847	BRE	LMB	SAR	PJS
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	MHF	MJH	JGK	NHW
0	12/19/91	APPROVED FOR CONSTRUCTION	SAR	BRE	SAR	JS / GK
			EJ	AKY	BER	RSP
			ML	SR	RPK	BD
			GK	MH	JK	RG

REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
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CADFILE	B117165A	CADCODE	2B:IBM:ACD2:10.C2:SS
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ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Operations Office DE - AC06-86RL10838</p>
REV. _____	DATE _____	
ERO. _____		
SIGNATURE	DATE	

PROJ. DIR. R. GIBBONS	12-19-91	 <p>FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION</p>
O.A. ENGR. J. KELLY	12-19-91	

INDEPENDENT SAFETY M. HIGUERA	12-19-91	<p>CIVIL DRX LINES PROFILES</p>
PROJECT PKG ENGINEER B. DENNIS	12-18-91	
ENGINEERING MGR. G. KIMURA	12-17-91	
SUPERVISOR R. KUMAR	12-17-91	

DESIGN ENGINEER M. LIGHTLE	12-17-91	PROJECT TITLE HANFORD WASTE VTRIFICATION PLANT			
-------------------------------	----------	--	--	--	--

CHECKED S. RUNK	12-16-91	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160
--------------------	----------	-------------------------	-----------------------------------	-------------------------

DRAWN F. TEVES	12/16/92	SCALE SHOWN	BLDG. NO.	INDEX NO.
-------------------	----------	-----------------------	-----------	-----------

CLASSIFICATION NONE	BY NOT REQ'D	DRAWING NUMBER H-2-117165	SHEET 1	OF 1	REV. 3
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DISTRIBUTION CODE: 053

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ACAD

INITIALS: DRM

DATE: 3/29/93

QUALITY LEVEL II SAFETY CLASS 4

APR - 1 1993

2	4/1/93	REVISION PER CR-HWVP-0760	JS	DE	JS	
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR	BRE	SAR	JS / GK
0	12/19/91	APPROVED FOR CONSTRUCTION	EJ	AKY	BER	RSP
			ML	SR	RPK	BD
			GK	MH	JK	RG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117166A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Operations Office</p> <p>DE - AC06-86RL10838</p>				
REV. _____ DATE _____						
ERO. _____		 <p>FLUOR DANIEL, INC.</p> <p>ADVANCED TECHNOLOGY DIVISION</p>				
SIGNATURE						
DATE		<p>CIVIL SANITARY SEWER PROFILES</p>				
PROJ. DIR. R. GIBBONS						
12-19-91						
O.A. ENGR. J. KELLY						
12-19-91						
INDEPENDENT SAFETY M. HIGUERA						
12-19-91						
PROJECT PKG ENGINEER B. DENNIS						
12-18-91						
ENGINEERING MGR. G. KIMURA						
12-17-91		<p>PROJECT TITLE</p> <p>HANFORD WASTE VITRIFICATION PLANT</p>				
SUPERVISOR R. KUMAR						
12-17-91						
DESIGN ENGINEER M. LIGHTLE						
12-17-91		<p>PROJECT</p> <p>B-595</p>				
CHECKED S. RUNK						
12-16-91		<p>FLUOR CONTRACT NO.</p> <p>8457</p>				
DRAWN F. TEVES						
11-22-91		<p>CWBS NO.</p> <p>A160</p>				
CLASSIFICATION						
BY		<p>SCALE</p> <p>SHOWN</p>				
NOT REQ'D						
NONE		<p>BLDG. NO.</p>				
		<p>INDEX NO.</p>				
		<p>DRAWING NUMBER</p> <p>H-2-117166</p>				
		<p>SHEET</p> <p>1</p>				
		<p>OF</p> <p>1</p>				
		<p>REV.</p> <p>2</p>				

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DISTRIBUTION CODE: 053


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INITIALS: DRM
DATE: 3/29/93

QUALITY LEVEL II SAFETY CLASS 4

APR - 1 1993

2	4/1/93	REVISION PER CR-HWVP-0760	JSA	DDP	PRB									
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR	BRE	SAR	JS GK								
0	12/19/91	APPROVED FOR CONSTRUCTION	ML	SR	RPK	BD								
			GK	MH	JK	RG								
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS											
CADFILE	B117167A		CADCODE	2B: IBM: ACD2: 10.C2: SS										
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Operations Office</p> <p>DE - AC06-86RL10838</p>												
REV. _____ DATE _____														
ERO. _____		<p> FLUOR DANIEL, INC.</p> <p>ADVANCED TECHNOLOGY DIVISION</p>												
SIGNATURE														
DATE		<p>CIVIL SANITARY SEWER PROFILES</p>												
PROJ. DIR.														
R. GIBBONS														
12-19-91														
Q.A. ENGR.														
J. KELLY														
12-19-91														
INDEPENDENT SAFETY														
M. HIGUERA														
12-19-91														
PROJECT PKG ENGINEER		<p>HANFORD WASTE VITRIFICATION PLANT</p>												
B. DENNIS														
12-18-91														
ENGINEERING MGR.														
G. KIMURA														
12-17-91														
SUPERVISOR														
R. KUMAR														
12-17-91														
DESIGN ENGINEER							<p>PROJECT TITLE</p>							
M. LIGHTLE														
12-17-91														
CHECKED		PROJECT		FLUOR CONTRACT NO.		CWBS NO.								
S. RUNK		12-16-91		B-595		8457						A160		
DRAWN		SCALE		BLDG. NO.		INDEX NO.								
F. TEVES		11-14-91		SHOWN										
CLASSIFICATION		BY		DRAWING NUMBER		SHEET						OF		
NONE		NOT REQ'D		H-2-117167		1						1		
												REV.		
								2						

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DISTRIBUTION CODE: 053

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INITIALS: DRM

DATE: 3/29/93

QUALITY LEVEL II SAFETY CLASS 4

APR - 1 1993

2	4/1/93	REVISION PER CR-HWVP-0760	JAB	DRM	PRE	
1	8/21/92	REVISION PER CR-HWVP-656 AND MINOR CHANGES	SAR	BRE	SAR	JS / GK
0	12/19/91	APPROVED FOR CONSTRUCTION	EJ	AKY	BER	RSP
			ML	SR	RPK	BD
			GK	MH	JK	RG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117168A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838				
REV. _____ DATE _____ ERO. _____						
SIGNATURE		DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION			
PROJ. DIR. R. GIBBONS		12-19-91				
O.A. ENGR. J. KELLY		12-19-91				
INDEPENDENT SAFETY M. HIGUERA		12-19-91				
PROJECT PKG ENGINEER B. DENNIS		12-18-91				
ENGINEERING MGR. G. KIMURA		12-17-91				
SUPERVISOR R. KUMAR		12-17-91	CIVIL SANITARY SEWER PLAN & PROFILES			
DESIGN ENGINEER M. LIGHTLE		12-17-91				
CHECKED S. RUNK		12-16-91				
DRAWN D. SCHMER		5-8-91	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT			
CLASSIFICATION		BY	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
NONE		NOT REQ'D	SCALE SHOWN	BLDG. NO.	INDEX NO.	
DRAWING NUMBER H-2-117168		SHEET 1	OF 1	REV. 2		

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DISTRIBUTION CODE: 053


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INITIALS: DRM
DATE: 3/29/93

QUALITY LEVEL II SAFETY CLASS 4

APR - 1 1993

2	4/1/93	REVISION PER CR-HWVP-0760	<i>DRM</i>	<i>DRM</i>	<i>PRE</i>	
1	3/12/93	REVISION PER CR-HWVP-0847	BRE	LMB	SAR	PJS
			MHF	MJH	JGK	NHM
0	8/21/92	APPROVED FOR CONSTRUCTION	SAR	BRE	SAR	JS GK
			EJ	AKY	BER	RSP
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117172A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838				
REV. _____ DATE _____						
ERO. _____		 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION				
SIGNATURE	DATE					
PROJ. DIR.	8-20-92	CIVIL SANITARY SEWER SECTIONS & DETAILS				
R. POULTER						
O.A. ENGR.	8-20-92					
B. RITTBERG						
INDEPENDENT SAFETY	8-20-92					
A. YEE						
PROJECT PKG ENGINEER	8-20-92					
E. JACOBS						
ENGINEERING MGR.	8-20-92					
G. KIMURA						
SUPERVISOR	8-20-92	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT				
S. RUNK						
DESIGN ENGINEER	8-20-92	PROJECT		FLUOR CONTRACT NO.	CWBS NO.	
B. EISENBISE		B-595		8457	A160	
CHECKED	8-20-92	SCALE		BLDG. NO.	INDEX NO.	
S. RUNK		SHOWN				
DRAWN	1-14-91					
F. TEVES						
CLASSIFICATION	BY	DRAWING NUMBER		SHEET	OF	REV.
NONE	NOT REQ'D	H-2-117172		1	1	2

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DISTRIBUTION CODE: 053

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ACAD

INITIALS: DRM

DATE: 3/29/93

QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

1	4/1/93	REVISION PER CR-HWVP-0760	191	CRW	BRE	
0	8/21/92	ADDED PER CR-HWVP-656 APPROVED FOR CONSTRUCTION	SAR	BRE	SAR	JS / GK
			EJ	AKY	BER	RSP
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117174A		CADCODE	2B: IBM: ACD2: 10.C2: SS		
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Operations Office</p> <p>DE - AC06-86RL10838</p>				
REV. _____ DATE _____						
ERO. _____		 <p>FLUOR DANIEL, INC.</p> <p>ADVANCED TECHNOLOGY DIVISION</p>				
SIGNATURE						
DATE		<p>CIVIL</p> <p>SWX AND RWX PIPE</p> <p>PROFILES</p>				
PROJ. DIR.						
R. POULTER						
8-20-92						
O.A. ENGR.						
B. RITTBERG						
8-20-92						
INDEPENDENT SAFETY		<p>HANFORD WASTE VITRIFICATION PLANT</p>				
A. YEE						
8-20-92						
PROJECT PKG ENGINEER						
E. JACOBS						
8-20-92						
ENGINEERING MGR.						
G. KIMURA		<p>PROJECT TITLE</p>				
8-20-92						
SUPERVISOR		<p>PROJECT</p>				
S. RUNK						
8-20-92		<p>FLUOR CONTRACT NO.</p>				
DESIGN ENGINEER						
B. EISENBISE		<p>CWBS NO.</p>				
8-20-92						
CHECKED		<p>SCALE</p>				
S. RUNK						
8-20-92		<p>BLDG. NO.</p>				
DRAWN						
F. TEVES		<p>INDEX NO.</p>				
6-27-92						
CLASSIFICATION		<p>DRAWING NUMBER</p>				
BY						
NONE		<p>SHEET</p>				
NOT REQ'D						
H-2-117174		<p>OF</p>				
		<p>REV.</p>				
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		1				
		1				

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DISTRIBUTION CODE: 053

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ACAD

INITIALS: DRM

DATE: 3/29/93

QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

1	4/1/93	REVISION PER CR-HWVP-0760	JAL	OPW	APC	
0	8/21/92	ADDED PER CR-HWVP-656 APPROVED FOR CONSTRUCTION	SAR	BRE	SAR	JS GK
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117175A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Operations Office</p> <p>DE - AC06-86RL10838</p>				
REV. _____ DATE _____						
ERO. _____		 <p>FLUOR DANIEL, INC.</p> <p>ADVANCED TECHNOLOGY DIVISION</p>				
SIGNATURE						
PROJ. DIR.		8-20-92	<p>CIVIL</p> <p>SWX AND RWX PIPE</p> <p>PROFILES</p>			
R. POULTER						
Q.A. ENGR.		8-20-92				
B. RITBERG						
INDEPENDENT SAFETY		8-20-92				
A. YEE						
PROJECT PKG ENGINEER		8-20-92				
E. JACOBS						
ENGINEERING MGR.		8-20-92	<p>PROJECT TITLE</p> <p>HANFORD WASTE VITRIFICATION PLANT</p>			
G. KIMURA						
SUPERVISOR		8-20-92				
S. RUNK						
DESIGN ENGINEER		8-20-92	<p>PROJECT</p> <p>B-595</p>			
B. EISENBISE						
CHECKED		8-20-92	FLUOR CONTRACT NO.		CWBS NO.	
S. RUNK			8457		A160	
DRAWN		6-27-92	BLDG. NO.		INDEX NO.	
F. TEVES			SCALE		SHOWN	
CLASSIFICATION		BY	DRAWING NUMBER		SHEET	OF
NONE		NOT REQ'D	H-2-117175		1	1
					1	1

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DISTRIBUTION CODE: 053

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ACAD

INITIALS: DRM

DATE: 3/29/93




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QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

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1	4/1/93	REVISION PER CR-HWVP-0760	JS	DRM	BRE	
0	8/21/92	ADDED PER CR-HWVP-656 APPROVED FOR CONSTRUCTION	SAR	BRE	SAR	JS / GK
			EJ	AKY	BER	RSP
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117176A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838				
REV. _____ DATE _____ ERO. _____						
SIGNATURE		DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION CIVIL SWX AND RWX PIPE PROFILES			
PROJ. DIR. R. POULTER		8-20-92				
O.A. ENGR. B. RITTBERG		8-20-92				
INDEPENDENT SAFETY A. YEE		8-20-92				
PROJECT PKG ENGINEER E. JACOBS		8-20-92				
ENGINEERING MGR. G. KIMURA		8-20-92				
SUPERVISOR S. RUNK		8-20-92	HANFORD WASTE VITRIFICATION PLANT			
DESIGN ENGINEER B. EISENBISE		8-20-92				
CHECKED S. RUNK		8-20-92				
DRAWN F. TEVES		6-25-92	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
			SCALE SHOWN	BLDG. NO.	INDEX NO.	
CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV.	
NONE	NOT REQ'D	H-2-117176	1	1	1	

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DISTRIBUTION CODE: 053

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ACAD

INITIALS: DRM

DATE: 3/29/93

QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

2	4/1/93	REVISION PER CR-HWVP-0760	JHJ	DRM	PRE	
1	3/15/93	REVISION PER CR-HWVP-0847	BRE	SAR	LWB	PJS
			MHF	MJH	JGK	NHW
0	8/21/92	ADDED PER CR-HWVP-656 APPROVED FOR CONSTRUCTION	SAR	BRE	SAR	JS/GK
			EJ	AKY	BER	RSP
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117177A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838				
REV. _____ DATE _____ ERO. _____						
SIGNATURE		DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION CIVIL SWX, FWX, AND DRX PIPE PROFILES			
PROJ. DIR. R. POULTER		8-20-92				
O.A. ENGR. B. RITTBERG		8-20-92				
INDEPENDENT SAFETY A. YEE		8-20-92				
PROJECT PKG ENGINEER E. JACOBS		8-20-92				
ENGINEERING MGR. G. KIMURA		8-20-92				
SUPERVISOR S. RUNK		8-20-92	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT			
DESIGN ENGINEER B. EISENBISE		8-20-92				
CHECKED S. RUNK		8-20-92	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
DRAWN F. TEVES		7/13/92	SCALE SHOWN	BLDG. NO.	INDEX NO.	
CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV.	
NONE	NOT REQ'D	H-2-117177	1	1	2	

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DISTRIBUTION CODE: 053

C27

ACAD


INITIALS: DRM

DATE: 3/29/93

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78.79 80

QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

1	4/1/93	REVISION PER CR-HWVP-0760	DRM	BRE	
0	8/21/92	ADDED PER CR-HWVP-656 APPROVED FOR CONSTRUCTION	SAR	BRE	SAR JS GK
			EJ	AKY	BER RSP
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS		
CADFILE	B117178A		CADCODE	2B: IBM: ACD2: 10.C2: SS	
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Operations Office</p> <p>DE - AC06-86RL10838</p>			
REV. _____ DATE _____					
ERO. _____		<p> FLUOR DANIEL, INC.</p> <p>ADVANCED TECHNOLOGY DIVISION</p>			
SIGNATURE	DATE				
PROJ. DIR.	8-20-92	<p>CIVIL</p> <p>SWX AND FWX PIPE</p> <p>PROFILES</p>			
R. POULTER					
O.A. ENGR.	8-20-92				
B. RITTBERG					
INDEPENDENT SAFETY	8-20-92				
A. YEE					
PROJECT PKG ENGINEER	8-20-92	<p>HANFORD WASTE VITRIFICATION PLANT</p>			
E. JACOBS					
ENGINEERING MGR.	8-20-92				
G. KIMURA					
SUPERVISOR	8-20-92				
S. RUNK					
DESIGN ENGINEER	8-20-92	<p>PROJECT TITLE</p>			
B. EISENBISE					
CHECKED	8-20-92	PROJECT	FLUOR CONTRACT NO.	CWBS NO.	
S. RUNK		B-595	8457	A160	
DRAWN	6-25-92	SCALE	BLDG. NO.	INDEX NO.	
S. THOMSON		SHOWN			
CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV.
NONE	NOT REQ'D	H-2-117178	1	1	1

DISTRIBUTION CODE: 053

C28

ACAD

INITIALS: DRM

DATE: 3/29/93

QUALITY LEVEL II SAFETY CLASS 3

APR - 1 1993

1	4/1/93	REVISION PER CR-HWVP-0760 AND 0917	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	
0	8/21/92	ADDED PER CR-HWVP-656 APPROVED FOR CONSTRUCTION	SAR	BRE	SAR	JS / GK
			EJ	AKY	BER	RSP
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B117179A		CADCODE	2B: IBM: ACD2: 10.C2: SS		
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Operations Office</p> <p>DE - AC06-86RL10838</p>				
REV. _____ DATE _____						
ERO. _____		<p>CIVIL</p> <p>SWX AND FWX PIPE</p> <p>PROFILES</p>				
SIGNATURE	DATE					
PROJ. DIR. R. POULTER	8-20-92					
O.A. ENGR. B. RITTBERG	8-20-92					
INDEPENDENT SAFETY A. YEE	8-20-92					
PROJECT PKG ENGINEER E. JACOBS	8-20-92					
ENGINEERING MGR. G. KIMURA	8-20-92					
SUPERVISOR S. RUNK	8-20-92					
DESIGN ENGINEER B. EISENBISE	8-20-92					
CHECKED S. RUNK	8-20-92					
DRAWN S. THOMPSON	6-25-92	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160		
CLASSIFICATION		BY	DRAWING NUMBER	SHEET	OF	REV.
NONE		NOT REQ'D	H-2-117179	1	1	1

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APR - 1 1993

SAFETY CLASS 3

2	4/1/93	REVISED PER CR-HWVP-0690	KK	KKS	WF AT	PJS GNK
1	8/21/92	REVISED PER CR-HWVP-656 & OTHER MINOR CHANGES.	KK	KKS	WF AT	PJS GNK
0	12/19/91	APPROVED FOR CONSTRUCTION	EJ	AKY	BER	RSP
			SC	BR	WF KAO	GK
			EJ	MKH	JGK	RNG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			

CADFILE B122082A

CADCODE 2B:IBM:ACD2:10.C2:SS

ENGINEERING RELEASE

REV. _____ DATE _____

ERO. _____

SIGNATURE

DATE

PROJ. DIR.

R.N.GIBBONS

12-19-91

D.A. ENGR.

J.G.KELLY

12-19-91

INDEPENDENT SAFETY

M.J.HIGUERA

12-19-91

PROJECT PKG ENGINEER

E.R.JACOBS

12-17-91

ENGINEERING MGR.

G.N.KIMURA

12-17-91

SUPERVISOR

W.FRENCH K.A.OWREY

12-17-91

DESIGN ENGINEER

B.RETTIG

12-16-91

CHECKED

S.CLARK

12-16-91

DRAWN

M.KHOURI

12-16-91

CLASSIFICATION

NONE

BY

NOT REQ'D

U.S. DEPARTMENT OF ENERGY

Richland Operations Office

DE -- AC06-86RL10838



FLUOR DANIEL, INC.

ADVANCED TECHNOLOGY DIVISION

ELECTRICAL
STANDARD ASSEMBLIES

PROJECT TITLE

HANFORD WASTE VITRIFICATION PLANT

PROJECT

B-595

FLUOR CONTRACT NO.

8457

CWBS NO.

A160

SCALE

NONE

BLDG. NO.

20,21,23

INDEX NO.

DRAWING NUMBER

H-2-122082

SHEET

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OF

5

REV.

2

DISTRIBUTION CODE: 605

E5

ACAD

INITIALS: MK

DATE: 3-19-93

APR - 1 1993

SAFETY CLASS 3

2	4/1/93	REVISED PER CR-HWVP-0690.	KK	KKS	WAT	PJS
1	8/21/92	REVISED PER CR-HWVP-656.	KK	KKS	WAT	GNK
0	12/19/91	APPROVED FOR CONSTRUCTION	EJ	AKY	BER	RSP
			SC	BR	WAT	GK
			EJ	MKH	JGK	RNG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			

CADFILE B122082D

CADCODE 2B:IBM:ACD2:10.C2:SS

ENGINEERING RELEASE

REV. _____ DATE _____

ERO. _____

U.S. DEPARTMENT OF ENERGY

Richland Operations Office
DE - AC06-B6RL10838

SIGNATURE

DATE

PROJ. DIR.

R.N. GIBBONS

12-19-91

O.A. ENGR.

J.G. KELLY

12-19-91

INDEPENDENT SAFETY

M.J. HIGUERA

12-19-91

PROJECT PKG ENGINEER

E.R. JACOBS

12-17-91

ENGINEERING MGR.

G.N. KIMURA

12-17-91

SUPERVISOR

W. FRENCH K.A. OWREY

12-17-91

DESIGN ENGINEER

B. RETTIG

12-16-91

CHECKED

S. CLARK

12-16-91

DRAWN

M. KHOURI

12-16-91

CLASSIFICATION

NONE

BY

NOT REQ'D

DRAWING NUMBER

H-2-122082

SHEET

4

OF

5

REV.

2

FLUOR DANIEL, INC.
ADVANCED TECHNOLOGY DIVISIONELECTRICAL
STANDARD ASSEMBLIES
AND DETAILS

PROJECT TITLE

HANFORD WASTE VITRIFICATION PLANT

PROJECT

B-595

FLUOR CONTRACT NO.

8457

CWBS NO.

A160

SCALE

NONE

BLDG. NO.

20, 21, 23

INDEX NO.



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DISTRIBUTION CODE: 605

E8

ACAD


INITIALS: JJC

DATE: 3-22-93

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8 79 80

QUALITY LEVEL II
SAFETY CLASS 3

APR - 1 1993

2	4/1/93	REVISED PER CR-HWVP-0690 AND REMOVES HOLD CREATED BY DCN-007	KK	KKS	7/2/93	
1	8/21/92	REVISED PER CR-HWVP-656 & OTHER MINOR CHANGES	KK	KKS	WF AT	PJS GNK
0	12/19/91	APPROVED FOR CONSTRUCTION	EJ	AKY	BER	RSP
			SC	BR	WF KAO	GK
			EJ	MKH	JGK	RNG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B122093A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-B6RL10838				
REV. _____ DATE _____ ERO. _____						
SIGNATURE	DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION				
PROJ. DIR. R.N. GIBBONS	12-19-91					
D.A. ENGR. J.G. KELLY	12-19-91					
INDEPENDENT SAFETY M.J. HIGUERA	12-19-91					
PROJECT PKG ENGINEER E.R. JACOBS	12-17-91					
ENGINEERING MGR. G.N. KIMURA	12-17-91					
SUPERVISOR W. FRENCH K.A. OWREY	12-17-91	ELECTRICAL UNDERGROUND CABLE PLAN CONSTRUCTION UTILITIES				
DESIGN ENGINEER B. RETTIG	12-16-91					
CHECKED S. CLARK	12-16-91					
DRAWN M. KHOURI	12-16-91	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT				
CLASSIFICATION		BY	DRAWING NUMBER	SHEET	OF	REV.
NONE		NOT REQ'D	H-2-122093	1	1	2

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77 78 79 80

DISTRIBUTION CODE: 607

E10

ACAD



INITIALS: MK

DATE: 3-19-93

QUALITY LEVEL II
SAFETY CLASS 3

2

APR - 1 1993

2	4/1/93	REVISED PER CR-HWVP-0690	KK	KKS	APM	
1	8/21/92	REVISED PER CR-HWVP-656 & OTHER MINOR CHANGES	KK	KKS	WF AT	GNK RSP
0	12/19/91	APPROVED FOR CONSTRUCTION	EJ	AKY	BER	RSP
			SC	BR	WF KAO	GK
			EJ	MKH	JGK	RNG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B122084A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-B6RL1083B				
REV. _____ DATE _____ ERO. _____						
SIGNATURE		DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION  ELECTRICAL UNDERGROUND CONDUIT AND GROUNDING PLAN			
PROJ. DIR. R.N.GIBBONS		12-19-91				
O.A. ENGR. J.G.KELLY		12-19-91				
INDEPENDENT SAFETY M.J.HIGUERA		12-19-91				
PROJECT PKG ENGINEER E.R.JACOBS		12-17-91				
ENGINEERING MGR. G.N.KIMURA		12-17-91				
SUPERVISOR W.FRENCH K.A.OWREY		12-17-91	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT			
DESIGN ENGINEER B.RETTIG		12-16-91				
CHECKED S.CLARK		12-16-91	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
DRAWN M.KHOURI		12-16-91	SCALE 1/4" = 1'-0"	BLDG. NO. 20	INDEX NO.	
CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV.	
NONE	NOT REQ'D	H-2-122084	1	1	2	

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7.78 79 80

DISTRIBUTION CODE: 607

E11



ACAD

INITIALS: JJC

DATE: 3-22-93

APR - 1 1993

SAFETY CLASS 3

2	4/1/93	REVISED PER CR-HWVP-0690 AND CR-HWVP-0917R1	KK	KKS	YAO AM	
1	8/21/92	REVISED PER CR-HWVP-656 & OTHER MINOR CHANGES	KK	KKS	WF AT	PJS GNK
0	12/19/91	APPROVED FOR CONSTRUCTION	EJ	AKY	BER	RSP
			SC	BR	WF KAO	GK
			EJ	MKH	JGK	RNG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B122085A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-86RL10838				
REV. _____ DATE _____ ERO. _____						
SIGNATURE		DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION			
PROJ. DIR. R.N. GIBBONS		12/19/91				
D.A. ENGR. J.G. KELLY		12/19/91	 ELECTRICAL UNDERGROUND CONDUIT AND GROUNDING PLAN			
INDEPENDENT SAFETY M.J. HIGUERA		12/19/91				
PROJECT PKG ENGINEER E.R. JACOBS		12/17/91				
ENGINEERING MGR. G.N. KIMURA		12/17/91				
SUPERVISOR W. FRENCH K.A. OWREY		12/17/91				
DESIGN ENGINEER B. RETTIG		12/16/91	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT			
CHECKED S. CLARK		12/16/91	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
DRAWN M. KHOURI		12/16/91	SCALE 1/4" = 1'-0"	BLDG. NO. 21,23	INDEX NO.	
CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV.	
NONE	NOT REQ'D	H-2-122085	1	1	2	

DISTRIBUTION CODE: 607

E12

ACAD


INITIALS: MK

DATE: 3-19-93

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78 79 80

APR - 1 1993

SAFETY CLASS 3 (DBE AS NOTED)

2	4/1/93	REVISED PER CR-HWVP-0690	KK	KKS	WF AT	PJS GNK
1	8/21/92	REVISED PER CR-HWVP-656 & OTHER MINOR CHANGES	KK	KKS	WF AT	PJS GNK
0	12/19/91	APPROVED FOR CONSTRUCTION	EJ	AKY	BER	RSP
			SC	BR	WF KAO	GK
			EJ	MKH	JGK	RNG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B122086A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-B6RL10838				
REV. _____ DATE _____ ERO. _____						
SIGNATURE		DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION ELECTRICAL UNDERGROUND SECTIONS			
PROJ. DIR. R.N. GIBBONS		12-19-91				
O.A. ENGR. J.L. KELLY		12-19-91				
INDEPENDENT SAFETY M.J. HIGUERA		12-19-91				
PROJECT PKG ENGINEER E.R. JACOBS		12-17-91				
ENGINEERING MGR. G.N. KIMURA		12-17-91				
SUPERVISOR W. FRENCH/K.A. OWREY		12-17-91				
DESIGN ENGINEER B. RETTIG		12-16-91	PROJECT TITLE HANFORD WASTE VITRIFICATION PLANT			
CHECKED S. CLARK		12-16-91	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
DRAWN M. KHOURI		12-16-91	SCALE NONE	BLDG. NO. ---	INDEX NO.	
CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV.	
NONE	NOT REQ'D	H-2-122086	1	1	2	

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DISTRIBUTION CODE:

E13

ACAD

INITIALS: MK


DATE: 3-19-93

QUALITY LEVEL II



APR - 1 1993

SAFETY CLASS 3

2	4/1/93	REVISED PER HWVP-CR-0690	KK	KKS	APM	
1	8/21/92	REVISED PER HWVP-CR-656 & OTHER MINOR CHANGES.	KK	KKS	WF AT	PJS GNK
0	12/19/91	APPROVED FOR CONSTRUCTION	EJ	AKY	BER	RSP
			SC	BR	WF KAO	GK
			EJ	MKH	JGK	RNG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B122088A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		<p>U.S. DEPARTMENT OF ENERGY</p> <p>Richland Operations Office</p> <p>DE - AC06-B6RL10838</p>				
REV. _____ DATE _____						
ERO. _____		<p> FLUOR DANIEL, INC.</p> <p>ADVANCED TECHNOLOGY DIVISION</p>				
SIGNATURE						
DATE		<p>ELECTRICAL</p> <p>PWR, GNDG, HT TR &</p> <p>LTNG PROT PLAN</p> <p>BLDG 20</p>				
PROJ. DIR.						
R.N. GIBBONS						
12-19-91						
O.A. ENGR.						
J.G. KELLY						
12-19-91						
INDEPENDENT SAFETY		<p>PROJECT TITLE</p> <p>HANFORD WASTE VITRIFICATION PLANT</p>				
M.J. HIGUERA						
12-19-91						
PROJECT PKG ENGINEER						
E.R. JACOBS						
12-17-91						
ENGINEERING MGR.						
G.N. KIMURA						
12-17-91		<p>PROJECT</p> <p>B-595</p>				
SUPERVISOR						
W. FRENCH K.A. OWREY		<p>FLUOR CONTRACT NO.</p> <p>8457</p>				
12-17-91						
DESIGN ENGINEER		<p>CWBS NO.</p> <p>A160</p>				
B. RETTIG						
12-16-91		<p>SCALE</p> <p>1/4" = 1'-0"</p>				
CHECKED						
S. CLARK		<p>BLDG. NO.</p> <p>20</p>				
12-16-91						
DRAWN		<p>INDEX NO.</p>				
M. KHOURI						
12-16-91		<p>DRAWING NUMBER</p> <p>H-2-122088</p>				
CLASSIFICATION						
NONE		<p>SHEET</p> <p>1</p>				
BY						
NOT REQ'D		<p>OF</p> <p>1</p>				
		<p>REV.</p> <p>2</p>				

DISTRIBUTION CODE: 610

E14

ACAD

INITIALS: JJC


DATE: 3-22-93

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778 79 80

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QUALITY LEVEL II
SAFETY CLASS 3

APR - 1 1993

2	4/1/93	REVISED PER CR-HWVP-0960	KK	KKS	APM	
1	8/21/92	REVISED PER CR-HWVP-656 & OTHER MINOR CHANGES	KK	KKS	WF AT	PJS GNK
0	12/19/91	APPROVED FOR CONSTRUCTION	EJ	AKY	BER	RSP
			SC	BR	WF KAO	GK
			EJ	MKH	JGK	RNG
REV NO.	DATE	REVISION DESCRIPTION	APPROVAL INITIALS			
CADFILE	B122089A		CADCODE	2B:IBM:ACD2:10.C2:SS		
ENGINEERING RELEASE		U.S. DEPARTMENT OF ENERGY Richland Operations Office DE - AC06-B6RL10838				
REV. _____ DATE _____ ERO. _____						
SIGNATURE		DATE	 FLUOR DANIEL, INC. ADVANCED TECHNOLOGY DIVISION ELECTRICAL PWR, GNDG, HT TR & LTNG PROT PLAN BLDG 21 & 23			
PROJ. DIR. R.N.GIBBONS		12-19-91				
D.A. ENGR. J.G.KELLY		12-19-91				
INDEPENDENT SAFETY M.J.HIGUERA		12-19-91				
PROJECT PKG ENGINEER E.R.JACOBS		12-17-91				
ENGINEERING MGR. G.N.KIMURA		12-17-91				
SUPERVISOR W.FRENCH K.A.OWREY		12-17-91	HANFORD WASTE VITRIFICATION PLANT			
DESIGN ENGINEER B.RETTIG		12-16-91				
CHECKED S.CLARK		12-16-91	PROJECT B-595	FLUOR CONTRACT NO. 8457	CWBS NO. A160	
DRAWN M.KHOURI		12-16-91	SCALE 1/4" = 1'-0"	BLDG. NO. 21,23	INDEX NO.	
CLASSIFICATION	BY	DRAWING NUMBER	SHEET	OF	REV.	
NONE	NOT REQ'D	H-2-122089	1	1	2	

DISTRIBUTION CODE: 610

E15

ACAD

INITIALS: HS

DATE: 3-23-93

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77 78 79 80	